

INTELLIGENT VEHICLE-HIGHWAY SYSTEMS PROGRAM AND COMMERCIAL MOTOR VEHICLES

Y 4. C 73/7: S. HRG. 103-310

HEARING BEFORE THE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE ONE HUNDRED THIRD CONGRESS FIRST SESSION

OCTOBER 19, 1993

Printed for the use of the Committee on Commerce, Science, and Transportation

INTELLIGENT VEHICLE-HIGHWAY
SYSTEMS
DEPOSITORY



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INTELLIGENT VEHICLE-HIGHWAY SYSTEMS PROGRAM AND COMMERCIAL MOTOR VEHICLES

TUESDAY, OCTOBER 19, 1993

U.S. SENATE,

**SUBCOMMITTEE ON SURFACE TRANSPORTATION OF THE
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,**

Washington, DC.

The subcommittee met, pursuant to notice, at 10:10 a.m., in room SR-253 of the Russell Senate Office Building, Hon. J. James Exon (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: Donald M. Itzkoff, senior staff counsel, and William Clyburn, Jr., staff counsel; and Alan Maness, minority senior staff counsel.

OPENING STATEMENT OF SENATOR EXON

Senator EXON. The subcommittee please will come to order. I apologize to the witnesses for the brief delay we have had. So far as I know, we do not have any scheduled votes for at least the next hour or so, and maybe we can move ahead in an expeditious fashion.

This morning the Surface Transportation Subcommittee will consider the exciting world of intelligent vehicle-highway systems, known as IVHS. Congress lent its support to IVHS in the Intermodal Surface Transportation Efficiency Act of 1991, commonly known as ISTEA.

We have a group of most distinguished witnesses who will describe the ongoing efforts to develop "smart" highways and high-technology intelligent vehicles. The subcommittee will see a few demonstrations of the new IVHS technologies that are already in use today.

As chairman of this subcommittee, I have focused on safety as my top transportation priority. IVHS technology brings closer a new era of safe and efficient national highways—40,000 deaths and 5 million injuries occur every year because of traffic accidents, and IVHS technology can help reduce this tragic carnage.

In addition to safety improvements, IVHS offers a new horizon for transportation productivity. Traffic congestion on the U.S. roads has reached an all-time high, costing our Nation an estimated \$100 billion a year in lost productivity. Billions of dollars and billions of hours are lost in traffic jams. Fuel is wasted and the environment is damaged. In addition, the Nation's ability to afford new highway construction is obviously limited.

IVHS technology will help drivers, as well as State and local agencies to efficiently use existing infrastructures. All Americans will benefit from IVHS technologies. Imagine intelligent vehicle-highway systems that protect an automobile from theft; collision and avoidance systems that prevent accidents and reduce injuries; tracking and two-way communication devices which allow a mother and a father to locate a son or a daughter lost on a dark roadway; or navigation systems which allow visitors to find their way around a new city.

Advanced IVHS technology especially will benefit commercial motor vehicle operations. Trucks move billions of tons of freight, carrying 72 percent of all manufactured freight. With 3.7 million commercial trailers on our Nation's roadways today, IVHS technology will help these trucks operate properly and safely.

These technologies will help assure that motor carriers are in compliance with the safety rules and that the drivers operate their rigs in a responsible manner. IVHS technologies, including automated permitting and reporting, weigh-in motion devices, and on-board satellite communication systems, will promote safety and cost reduction for commercial vehicles and law enforcement. In addition, the IVHS promises substantial economic gain in the reduction of burdensome paperwork and border checks. With IVHS, trucks could be "precleared" on the interstate, with tolls and various State fees automatically deducted as drivers move along the highway at regular speeds.

As promising as these technologies are for the Nation, Congress cannot afford to let the IVHS program become a grab bag for pork barrel politics. For this fiscal year alone, Congress will appropriate some \$200 million for IVHS-related programs. Frankly, I am concerned by the number of these IVHS demonstration projects which result from congressional earmarks rather than strategic policy considerations.

This subcommittee will continue to press to make safety improvements and enforcement a top IVHS priority, and encourage a fair, competitive national approach to IVHS funding decisions. The hearing today will focus on several key issues, including the progress that has been made in implementing IVHS technology, policy goals of the IVHS program, participation of the States, and the prospect of applying defense technologies to transportation safety and efficiency. Mr. Chairman, your comments, please.

OPENING STATEMENT OF SENATOR HOLLINGS

The CHAIRMAN. The Surface Transportation Subcommittee will hear testimony this morning on the Intelligent Vehicle-Highway System Program and commercial motor vehicles. At this hearing, the subcommittee will review a number of important issues, including: one, the current status of the implementation by the Federal Highway Administration of the National IVHS Program, with particular attention to the commercial vehicle operations component of the program; two, the appropriate policy goals for the CVO component, including steps necessary to assure the broadest possible participation of both the States and the private sector in this program; three, a discussion of the potential for IVHS technology to improve highway safety and how the IVHS CVO component can promote

most expeditiously the effectiveness of the Motor Carrier Safety Assistance Program; and four, an assessment of available and prospective U.S.-owned technologies and processes which can be used in the research, testing, development, and commercialization of IVHS CVO systems.

Today, drivers of commercial vehicles and private automobiles alike demand more and more of our Nation's roadways. Despite continued funding for new highway construction and expansion, the resulting congestion costs this Nation billions of dollars each year in time delays and lost productivity. We continue to be concerned about the impact of vehicle emissions on our environment. Needless traffic accident deaths and injuries occur daily. As chairman of the Commerce Committee, I long have emphasized the importance of a safe and efficient transportation system and recognize that an intelligent-vehicle highway system has the possibility not only to save lives, but also to boost productivity and provide jobs and economic opportunities to enhance our national competitiveness.

To that end, the Intelligent Vehicle-Highway Systems Act, as incorporated in the Intermodal Surface Transportation Act of 1991, provides an excellent opportunity to combine private and public programs, funding, and technologies to create a truly integrated, uniform national "smart" highway system. For example, this program can help to promote the development and implementation of automated reporting and permitting for commercial vehicles and research on and the deployment of collision-avoidance and congestion-monitoring systems. For the future, the potential benefits of IVHS are most promising.

I am pleased to have with us this morning the Honorable Rodney E. Slater, FHWA Administrator, accompanied by George L. Parker, Associate Administrator of Research and Development for the National Highway Traffic Safety Administration. They will describe the Department of Transportation's plans for and progress in implementing the IVHS program, including the commercial vehicle component of IVHS. We also have two distinguished panels of witnesses, representing industry, State officials, and institutional interests, to discuss policy considerations and to demonstrate various technologies. I look forward to the testimony.

Senator EXON. Thank you, Mr. Chairman. The subcommittee is pleased to welcome The Honorable Rodney E. Slater, Administrator for the FHWA, accompanied by George L. Parker, the Associate Administrator for the National Highway Safety Administration. They will testify as to the Department of Transportation's progress in ensuring the goals of the IVHS program, including the commercial vehicle component of the program.

The committee also will hear from two distinguished panels of witnesses, representing the IVHS industry and the States. These individuals are on the front line, researching and deploying these new technologies. I look forward to a useful discussion of policy considerations and demonstration of some IVHS technologies.

I thank all of the witnesses for appearing before the subcommittee and look forward with keen interest to the testimony. The full statements of all of the witnesses, without objection, will be included in the record. The witnesses hopefully will summarize their formal statements.

With that, I would ask any other members of the subcommittee if they have any opening statements?

OPENING STATEMENT OF SENATOR MATHEWS

Senator MATHEWS. Thank you, Mr. Chairman. I do not have an opening statement, but I would like to take just a moment to welcome Mr. Slater to the committee here this morning. We have had the opportunity in times past of working together in some other endeavors, and I have come to respect his ability. And I know that in leading the transportation program, this phase of the transportation program, he is going to do a good job.

This is my first day, I guess, my first appearance as a member of this particular subcommittee, so we are both in for firsts. And I welcome you and your staff.

Let me apologize in advance. I do have to preside this morning, so I will have to be leaving in a short time. But I do look forward to working with you, Mr. Chairman, and the committee.

Senator EXON. Senator Mathews, thank you very much.

Senator Burns.

Senator BURNS. I have no statement. I welcome Mr. Slater also and look forward to his testimony. Thank you very much, Mr. Chairman.

Senator EXON. Thank you very much.

We will then proceed with the opening statement that I would hope each of you would summarize, as I have indicated earlier. With that, we will begin the testimony in any fashion that you see fit.

STATEMENT OF HON. RODNEY E. SLATER, ADMINISTRATOR, FEDERAL HIGHWAY ADMINISTRATION; ACCCOMPANIED BY GEORGE L. PARKER, ASSOCIATE ADMINISTRATOR FOR RESEARCH AND DEVELOPMENT, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Mr. SLATER. Thank you, Mr. Chairman, Senator Mathews, Senator Burns.

I am pleased to make my first appearance before this committee and I commend you, Mr. Chairman, and members of the committee for calling this hearing to discuss the exciting world of IVHS technology.

With me, as noted, this morning is Mr. George Parker, the Associate Administrator for Research and Development for the National Highway Traffic Safety Administration, NHTSA, for NHTSA shares an interest with the FHWA in the issues before us today.

I am excited about the Intelligent Vehicle Highway Systems Program, including the commercial vehicle operations component and the bearing it has on the future of transportation. I am pleased that so many of our partners in the IVHS community and those involved in this IVHS endeavor are here today, some of whom I met as early as my first week on the job, notably Dr. James Constantino with IVHS AMERICA, as I attended the third annual IVHS AMERICA national meeting. Others I have recently met, such as Mr. James Kolstad of Vorad Safety Systems, and many others.

As the U.S. transportation policies evolve from constructing new facilities to more efficient operation and maintenance of existing facilities, we envision that IVHS technologies will play a significant role, particularly on the new national highway system called for in ISTEA.

President Clinton and Secretary of Transportation Federico Peña share a strong commitment to harnessing technology to improve our transportation system. They believe that transportation must play a key role in our Nation's long-term sustained growth. I share that belief.

To this end, Secretary Peña has established a straightforward set of goals for our Department. I would like to take a moment to share those with you and to discuss how IVHS technology can help us achieve these goals.

First, the Department's highest priority is to get our economy moving through strategic transportation investments. IVHS holds particular promise in helping to achieve renewed economic prosperity through the creation of new industries and consumer markets, including the conversion of applicable defense technologies to civilian use.

Second, we must ensure that our investments improve daily life by making travel safer, more efficient, more humane. This is where the real excitement with IVHS lies, in its potential for saving lives, for moving freight more effectively, and for reassuring drivers and the public that the vehicles and roadways are safe. IVHS technologies can also assist drivers with their driving tasks. Although our interstate highways are the safest in the world, I am personally committed to ensuring that roadway safety remains one of the Department's highest priorities. And I know, Senator Exon, that that is one of your highest priorities.

For example, we recently experienced a very significant series of accidents on the Washington Beltway. To address this continued Beltway problem, the Department started an initiative that we call the Capital Area Safety Committee, which includes several Members of Congress from the area. Eventually we hope that applications of IVHS techniques may make the Beltway safer and more convenient to use.

Our third goal is to ensure that transportation investments are made in ways that will assist our environmental efforts. IVHS technologies, by enhancing carpool and transit services, could lead to a decrease in the number of single-occupancy vehicles on the road. The result would lessen congestion, lessen emissions, and bring about greater energy conservation.

Fourth, we must advance transportation technology and expertise. The Department is working very closely with universities, national laboratories, and others to develop our research program and to ensure that those managing advanced technology systems have the necessary tools and skills. For example, the FHWA recently announced the selection of three universities to serve as IVHS research centers of excellence: the University of Michigan; Texas A&M University; and Virginia Polytechnic Institute.

Fifth and finally, we must integrate all modes of transportation into a seamless intermodal system for moving goods and people. The IVHS program is a cooperative effort with the Federal High-

way Administration, the NHTSA, and the Federal Transit Administration all playing key roles. It is also a public-private partnership in all respects, and you will hear a lot about that during today's session.

Let me give a brief update of the status of IVHS development. Using the resources provided by Congress, the Department has moved forth expeditiously and has been extremely busy and productive over the last 3 years working to build a national IVHS program. This national program will meet the goals and objectives established in the IVHS Act of 1991, which is part of the Intermodal Surface Transportation Efficiency Act of 1991.

Key elements of the National IVHS Program have been planned and are being implemented as we speak. Extensive work is underway to achieve these objectives. Early successes include initiating an effective alliance with the many public and private sector organizations, through IVHS AMERICA, which have a stake in the success of the IVHS program.

Also, we are inaugurating efforts to learn more about critical IVHS institutional, technical, and program delivery issues. These are initial efforts described in our IVHS strategic plan, which we delivered to Congress in December 1992. To accomplish the rest of the strategic plan, we are drafting a comprehensive national IVHS program plan. This plan defines the IVHS user services and the research and operational tests of the technical and institutional elements which are needed to fully develop and deploy with this program. Critical nontechnical issues, including legal, institutional, procurement, antitrust, and privacy concerns are also being addressed in this comprehensive program.

Let me close with just one or two comments about the status of the Commercial Vehicle Operations Program as it relates to IVHS technology. The Federal Highway Administration is currently involved in several areas of implementation in IVHS commercial vehicle operations. The services are being refined and summarized in the national IVHS plan. Priorities of electronic clearance and automated roadside inspections have been established.

In addition, research contracts to develop a compatible automated vehicle identification and vehicle-road communication standard is underway. Sandia National Laboratories is investigating state-of-the-art safety technologies, and we are also providing \$50,000 to each State to examine institutional issues related to implementing the commercial vehicle operations.

With those statements, Mr. Chairman, I would now like to respond to any questions that you or members of the committee might have, and Mr. George Parker would also join me in responding to any questions you might have.

[The prepared statement of Mr. Slater follows:]

PREPARED STATEMENT OF RODNEY E. SLATER

I am pleased to make my first appearance before this Committee and commend the Chairman and the Committee for calling this hearing. Accompany me today is George Parker, the Associate Administrator for Research and Development for the National Highway Traffic Safety Administration (NHTSA). I am excited about the intelligent Vehicle-Highway Systems (IVHS) program, including its Commercial Vehicle Operations component, and the bearing IVHS has on the future of transportation. As a former Chair of the Arkansas State Highway Commission, I have a great deal of respect for the expertise and dedication of those in the transportation

profession. I'm proud to now serve with this group of transportation professionals at the national level.

My involvement with IVHS began immediately upon my arrival at the Federal Highway Administration (FHWA). Last April I attended the 3rd Annual Meeting of IVHS AMERICA and I was struck by the degree of public and private activity in this arena, as well as the multitude of technologies being discussed and displayed.

President Clinton and Secretary of Transportation Federico Peña share a strong commitment to harnessing technology to improve our transportation system. They believe that transportation must play a key role in the Nation's long-term, sustained growth. To this end, Secretary Peña has established a straightforward set of goals for our Department. I would like to share these with you and discuss how the IVHS program can help us achieve these goals.

First, one of the Department's priorities is to get our economy moving through strategic transportation investments. IVHS holds particular promise in helping to achieve renewed economic prosperity through the creation of new industries and consumer markets, including the conversion of applicable defense technologies to civilian uses.

Second, we must ensure that our investments improve daily life by making travel safer, more convenient, and more "human." This is where the real excitement with IVHS lies: in its potential for saving lives, for moving freight more effectively, and reassuring drivers and the public that the vehicles and roads are safe. IVHS technologies can also assist drivers with their driving task. Although our interstate highways are the safest in the world, I am personally committed to ensuring that roadway safety remains a very high priority. With the involvement of several Members of Congress, I am chairing an initiative of the Capital Area Safety Committee. We are examining means to improve highway, vehicle, and driver safety on the Washington, D.C., Beltway—a highway which has heavy usage and many traffic problems.

Our third goal is to ensure that transportation investments are made in ways that will assist our environmental efforts. IVHS technologies that enhance car pool and transit services could lead to a decrease in the number of single occupancy vehicles on the road. The result would be less congestion and a reduction in vehicle emissions and energy consumption.

Fourth, we must advance transportation technology and expertise. The Department is working very closely with universities, the National Laboratories, and others to strengthen our research program and to ensure that those managing advanced transportation systems have the necessary tools and skills. For example, the FHWA recently announced the selection of three universities to serve as IVHS Research Centers of Excellence: the University of Michigan; Texas A&M University; and Virginia Polytechnic Institute.

Fifth and finally, we must integrate all modes of transportation into a seamless intermodal system for moving goods and people. The IVHS program is a cooperative effort, with the Federal Highway Administration, the National Highway Traffic Safety Administration, and the Federal Transit Administration playing key roles. It is also a private/public partnership in all respects.

IVHS STATUS

Using the resources provided by Congress, the Department has been extremely busy and productive over the last three years working to build a National IVHS Program. This National Program will meet the goals and objectives established in the Intelligent VehicleHighway System Act of 1991, which is part of the Intermodal Surface Transportation Efficiency Act of 1991, or ISTEA. Key elements of the National IVHS Program have been planned and are being implemented. Extensive work is underway to achieve the other objectives. Early successes include:

- Initiating an effective alliance with the many private and public sector organizations (such as IVHS AMERICA) which have a stake in the success of the IVHS program.
- Initiating efforts to learn more about critical IVHS institutional, technical, and program delivery issues. Our IVHS Strategic Plan, which we delivered to Congress in December 1992, is designed to address these issues. To implement this Strategic Plan, we are drafting a comprehensive National IVHS Program Plan. This Program Plan defines the IVHS user services, and the research and operational tests of the technical and institutional elements which are needed to fully developed them. Critical non-technical issues, including legal, institutional procurement, antitrust, and privacy concerns are being addressed in this comprehensive program.

- Sparking private sector interest and involvement in the National IVHS Program, along with the National Laboratories and defense-oriented companies. We

continue to accelerate partnerships in major program areas such as development of the National IVHS Program Plan, operational tests, and research and deployment efforts.

- Fostering cooperation among Departmental administrations for individual IVHS projects, as well as for overall IVHS program management, has been key to success. We continue to highlight the importance of intermodal applications in the development of IVHS user services.

- Initiating a three-year process to establish the overall national IVHS system architecture. This architecture will define a set of IVHS functions and communications interfaces, such that continuing evolutionary improvements to IVHS user services are possible, while a competitive marketplace for development of compatible private sector goods and services is maintained. Last week, I met with the leaders of the four outstanding teams of public and private entities which we now have under contract with us to develop IVHS architecture alternatives.

- Identifying and analyzing key areas of concern for the creation of an automated highway system, and initiating studies and plans towards having a prototype demonstration by 1997. Later this week, I will host a public information meeting on our plans for this prototype demonstration.

As the FHWA celebrates its one hundredth anniversary, the future of highway transportation takes on a special meaning. The U.S. can take pride in installing the world's finest transportation infrastructure. Now, with the passage of the ISTEA, we can focus our attention on applying advanced technologies to improve and revolutionize that infrastructure, and to improve system performance in terms of congestion relief, mobility enhancement, increased safety, less air pollution, conservation of energy resources, and improved transportation productivity.

COMMERCIAL VEHICLE OPERATIONS VISION

Secretary Peña outlined earlier this year the Department's objective to use advanced technologies to increase safety and productivity of the motor carrier industry. Vital safety and regulatory checks would be made automatically, and electronically, eliminating delays to carriers. Truck and bus fleets would be able to electronically purchase credentials. This standard, nationally uniform credential data, along with safety, tax, and registration information, would be accessible nationwide so that compliant vehicles would not have to stop at inspection facilities.

The goals of the Commercial Vehicle Operations portion of the National IVHS Program are to make major increases in the safety and productivity of our Nation's highways. We envision safe and legal trucks and buses traveling throughout the country in the same manner as automobiles; that is, without having to stop in each State for weight, credential, or safety checks, as they do today. Instead, trucks and buses will be checked by technologically-advanced sensors as they move down the highway at prevailing speeds. This will increase productivity for carriers by reducing delays and unnecessary paperwork. States will enjoy increased productivity, as well, since they will no longer need to perform checks on vehicles already in compliance or process the accompanying paperwork. Sensors and diagnostic equipment will monitor driver, vehicle, and cargo safety in "real time" so that corrective action can be taken before a potential accident occurs. Automating the roadside inspection process will more accurately reflect the safety status of the driver and vehicle in a fraction of the time these manual inspections currently require.

In the future, only trucks with known or suspected safety and compliance problems would be stopped by enforcement officers for checks. The vast majority of commercial motor vehicles, traveling safely and without violations, will proceed without delays to deliver their cargoes and passengers. In short, we will create and use an "information highway" which will make our concrete and asphalt highways more effective and efficient.

The Department believes that Commercial Vehicle Operations will be among the first IVHS technologies to be deployed because the cost savings and benefits to the motor carrier industry, as well as to government programs, will be significant. We have already seen major truck and bus companies installing new technologies to improve their fleet management. Automating the mileage and fuel tax reporting process by interstate carriers should significantly reduce the annual processing costs of \$4 billion for carriers and States. Using weigh-in-motion scales for weight checks would reduce delays for inter- and intrastate trucks. IVHS/Commercial Vehicle Operations will provide ways to electronically clear and screen commercial vehicles in order to target those with compliance problems. This will improve compliance and safety, with less costs to the industry.

COMMERCIAL VEHICLE OPERATIONS SERVICES

The Commercial Vehicle Operations program is composed of six services that will significantly increase commercial vehicle safety and productivity.

1. Commercial Vehicle Electronic Clearance

With this service in place, participating carriers whose drivers and vehicles operate in a safe and legal manner would have their credentials and weighing inspections completed electronically as they travel at highway speeds, eliminating the need to stop in each State for these inspections. Operationally, the system would accommodate both interstate and intrastate carriers. This service would reduce operational delays for both States and carriers for these inspections. Simply weighing a vehicle can take from 30 seconds to five minutes. This is in addition to the delays due to congestion around the inspection facility. At a dollar a minute, carriers, and ultimately the customers, would save millions of dollars. States would also save millions. For example, by implementing IVHS technologies, and being more efficient, States would be able to avoid the cost of building a new weight station and employing additional personnel. Eliminating the need for commercial vehicles to change lanes, pull off highways and then merge back into traffic minimizes the disruption of traffic, making the roadway enforcement safer to all motorists. Also, IVHS works 24 hours a day, while most weigh stations do not.

2. International Border Electronic Clearance

This Commercial Vehicle operations service would extend the Commercial Vehicle Electronic Clearance user service to electronic clearance at the international borders of Mexico and Canada, thereby addressing the specialized issues associated with crossing international borders. Productivity would be improved from reduced delays and safety will be enhanced in much the same manner as at State facilities using electronic clearance. Currently, there are significant delays for automobile and truck drivers crossing between the United States and both Canada and Mexico. Electronic clearance would provide for a more efficient traffic flow. By working with those countries to deploy the technologies on their sides of the border, we can ultimately prevent overweight, unsafe, or improperly registered vehicles from even entering the United States.

3. Automated Roadside Safety Inspections

The two components of this service are specifically aimed at significantly enhancing the safety of commercial motor vehicle operations. Both would greatly increase inspectors' effectiveness and reduce delays to carriers as a safety inspection can take up to 30 minutes to complete.

a. Comprehensive and Timely Access to Data

The States and Federal government already collect large amounts of data on commercial vehicle operations. We need to find the proper integration of these and other data to make the safety inspection focus on the poor performers. This service would also allow "real-time" access at the roadside to the safety performance record of carriers, vehicles, and drivers. Such access will help determine which vehicle or driver should be stopped for an inspection, as well as ensuring timely correction of previously identified problems.

b. Automation of the Manual Inspection

This service would automate as many items as possible of the manual inspection process. It would, for example, allow for more rapid and accurate inspection of brake performance at the roadside. Through the use of sensors and diagnostics, it would efficiently check vehicle systems and driver requirements and ultimately driver alertness and fitness for duty.

4. Commercial Vehicle Administrative Processes

a. Electronic Purchase of Credentials

This service would provide the carrier with the capability to electronically purchase annual and temporary credentials via computer link. It will reduce burdensome paperwork and processing time.

b. Automated Mileage and Fuel Reporting and Auditing

This service would enable participating interstate carriers to electronically capture mileage, fuel purchased, trip, and vehicle data by State. It also would automatically determine mileage traveled and fuel purchased in each State, for use by the carrier in preparing fuel tax and registration reports to States. The administrative burden on carriers to collect and report mileage and fuel purchased within each

State is significant. This service would significantly reduce the cost for collecting both types of data.

5. On-Board Safety Monitoring

On-board systems would monitor the safety status of a vehicle, cargo, and driver at mainline speeds. Vehicle monitoring would include sensing and collecting data on the condition of critical vehicle components such as brakes, tires, and lights, and determining thresholds for warnings and countermeasures. Cargo monitoring would involve sensing unsafe conditions relating to vehicle cargo, such as shifts in cargo while the vehicle is in operation. Driver monitoring is envisioned to include the monitoring of driving time and alertness using non-intrusive technology and the development of warning systems for the driver, the carrier, and the enforcement official. A warning of unsafe condition would first be provided to the driver, then to the carrier and roadside enforcement officials and would possibly prevent an accident before it happens. This service would minimize driver- and equipment-related accidents for participating carriers.

6. Commercial Fleet Management

The availability of real-time traffic information and vehicle location for commercial vehicles would help dispatchers to better manage fleet operations by helping their drivers to avoid congested areas and would also improve the reliability and efficiency of carriers pickup-and-delivery operations. The benefits from this service would be substantial for those intermodal and time-sensitive fleets who can use these JVHS technologies to make their operations more efficient and reliable.

7. Hazardous Materials Incident Notification

This service would enhance the safety of shipments of hazardous materials by providing enforcement and response teams with timely, accurate information on cargo contents to enable them to react properly in emergency situations. The system would focus on determining when an incident involving a truck carrying hazardous material occurs, the nature and location of the incident, and the material or combination of materials involved so that the incident can be handled properly.

COMMERCIAL VEHICLE OPERATIONS PRIORITIES

The FHWA's two priorities for the Commercial Vehicle Operations program are "Commercial Vehicle Electronic Clearance" and "Automated Roadside Safety Inspections." To implement these priorities, the FHWA will work with States and industry to define a national model for each service, outline the functional requirements and architecture, and develop an implementation plan. This effort will be complemented by the Department's responsibility to develop standards and guidelines to ensure that IVHS components are compatible and can be used nationwide.

COMMERCIAL VEHICLE OPERATIONS STATUS

The FHWA is currently involved in several areas of implementation in the IVHS Commercial Vehicle Operations program. The areas are being refined and summarized in the National IVHS Program Plan. Priorities for electronic clearance and automatic roadside inspection were established in the Plan. In addition, a contract with the Lawrence Livermore National Laboratory and the National Institute of Standards and Technology to develop a compatible Automatic Vehicle Identification and Vehicle to Road Communication standard is under way. Sandia National Laboratory is investigating state-of-the-art safety technologies. We also provided \$50,000 to each State to examine institutional issues related to implementing Commercial Vehicle Operations. Forty-seven States are participating. These studies are fostering cooperative initiatives both among agencies within individual States and between States to streamline motor carrier regulatory requirements and processes. Some of these studies involve multi-state groups. Finally, several operational tests are under way and are in various phases of completion, including: HELP/Crescent along I-5/I-10 in the west and the Advantage I-75 in the Midwest. These tests are pioneering the concepts of using IVHS technologies to improve the efficiency of motor carrier operations.

Participation.—To implement electronic clearance activities by 1997 will require consensus among various State agencies and the private sector. Consensus is the key ingredient because State and industry participation will improve communications and access to multiple State, Federal and possibly private data bases.

From the start of the Commercial Vehicle Operations program, the FHWA has recognized the importance of consensus building among all of the involved parties. To obtain the broadest participation of both States and industry in the Commercial Vehicle Operations program, the FHWA has actively pursued input from them as

well as key organizations from the earliest conceptual phases through deployment. These organizations not only give valuable input to the Commercial Vehicle Operations program, they form the bonds of a partnership between the FHWA, States, industry, and suppliers. These organizations include: the National Governors' Association, the American Association of State Highway and Transportation Officials, the Commercial Vehicle Safety Alliance, the National Private Truck Council, the American Trucking Associations, truck manufacturers, owner-operators, and the National Motor Carrier Advisory Committee. We will continue to work closely with the organizations to foster the implementation of the Commercial Vehicle operation program component of the National IVHS Program.

COMMERCIAL VEHICLE OPERATIONS AND MOTOR CARRIER SAFETY ASSISTANCE PROGRAM EFFECTIVENESS

Now I would like to discuss in more detail one of the most important parts of our program: safety. The FHWA continues to place a high priority on safety. Our major partnership with the States on motor carrier safety is through the Motor Carrier Safety Assistance Program. The safety program, which has been highly successful, provides grants to the States that support roadside inspections, reviews, traffic enforcement, and other safety initiatives. Through the safety program, the States have adopted uniform regulations and safety enforcement of commercial motor vehicles both in interstate and intrastate commerce. Only a few States had commercial vehicle safety programs prior to 1984 when the safety program began. Now every State has one. Canada's federal government and its Provinces have also adopted similar on-the-road inspection programs. As we have worked with the States to develop nationwide, uniform, comprehensive motor carrier safety programs, the accident rates for commercial motor vehicles have come down even though the volume of trucks on the highway has increased.

The Commercial Vehicle Safety Alliance (CVSA) serves as a forum to address uniform enforcement, develop procedures, and share information. The CVSA is an association of State and local officials responsible for motor carrier safety enforcement and compliance programs; it includes representatives from the States, the Canadian Provinces, and Mexico, as well as it also includes a significant cross section of industry representatives as associate members. Through the CVSA, the States and the FHWA have agreed upon uniform inspection procedures and identified and enforce those violations that are so serious that the vehicle or driver is placed "out-of-service" until the defect is corrected. Vehicles that pass a uniform inspection are given a CVSA decal that is honored by other States and the vehicle is not reinspected for up to 3 months. This helps program officers focus on vehicles that have not been recently inspected.

Under our safety program, 1.6 million vehicles and drivers are stopped for uniform safety inspections annually by the States. These inspections vary from a full inspection of the driver and vehicle (which takes 30 to 40 minutes) to a traffic stop with an inspection of just the driver's credentials. Data from these inspections are entered into the FHWA's national data base, called SAFETYNET. The data are used to monitor a carrier's safety performance and target carriers for follow up reviews and enforcement.

The safety program is at a turning point. We have successfully met our initial challenge of getting States involved in uniform commercial vehicle roadside inspection and carrier review programs. Our challenge now is to improve the efficiency and effectiveness of ongoing safety activities. IVHS technologies offer us the opportunity to accelerate, automate, and streamline vehicle and driver inspection procedures. These technologies will allow us to provide timely safety performance data to officers at the roadside to ensure repair of prior identified problems and to target carriers experiencing high accident or driver-vehicle out-of-service rates. Having spent a considerable amount of time dealing with truck safety issues, first in Arkansas and more recently on the Capital Beltway, I know first hand the need to make our safety programs more effective and focused.

ADVANCED ROADSIDE SAFETY TECHNOLOGIES

Inspecting vehicles on the roadside and at inspection stations is the primary State activity under the safety program. We need to use advanced information and communications technology to identify which vehicles should be inspected. For example, as a vehicle approaches a checkpoint and is identified electronically, State personnel would access data on performance and compliance with selected requirements. The State personnel would use this information to decide whether to clear the vehicle (without a stop) or select ones with potential problems. Vehicles placed out of serv-

ice during a recent roadside inspection would be "flagged" until the defects are corrected.

An example of how integrating existing data can be used to improve the efficiency of the safety program and the States' programs is the "Premier Carrier Program," which is now under development. The Premier Carrier Program will build on this current procedure by selecting carriers with exemplary safety records and allowing them to obtain decals (or in the future an electronic tag) so they can bypass safety inspection. Obviously, the carriers will need to provide additional safety and compliance information to the States and the FHWA to monitor their ongoing safety performance. This would further allow Program officers to focus their enforcement efforts on other companies. We are working with the CVSA and the States to begin a pilot of the Premier Carrier Program in calendar year 1994.

Our inspection data shows that about 30 percent of vehicles that receive a full safety inspection have defects that put the vehicle out-of-service. The largest percentage of these out-of-service violations are due to defective or out-of-adjustment brakes. We are testing a variety of mobile and permanently-installed equipment (e.g., skid and friction pad devices and rolling dynamometers) to accurately and quickly test the performance of the brakes. infra-red and other sensors are also being tested to examine trucks at highway speeds and target vehicles with problems that should be pulled over for an safety inspection. We are interested in exploring the use of robotics in advanced inspection facilities. We want to reduce the entire time for this safety inspection to a matter of minutes.

The driver's condition and performance are the most critical elements in the safe operation of any vehicle. Our long term goal is for commercial vehicles to have on-board monitors to assess vehicle and driver safety. These monitors would notify the driver and company when an unsafe condition needs to be corrected.

We are conducting extensive research into driver fatigue and impairment, and developing devices to monitor and warn the driver of problems. Real time access to driver data by enforcement officers such as licensing1 traffic citations, and driver out-of-service violations would also improve problem driver enforcement through the safety program.

NHTSA RESEARCH

The National Highway Traffic Safety Administration (NHTSA), one of our key Departmental partners in the National IVHS Program, is making good progress in its research on the potential safety benefits of IVHS technology. NHTSA's efforts in this regard have two major objectives: (1) to facilitate the development and deployment of advanced systems that help drivers avoid crashes; and (2) to ensure that advanced systems do not create adverse safety effects.

Because IVHS systems may be initially installed in commercial trucks, NHTSA has included this application in the agency's research. Currently, systems are available that assist truck drivers in avoiding rear-end collisions and collisions when changing lanes or backing up. Systems under development include devices that monitor driver alertness, give collision warning signals at intersections, enhance driver vision under conditions of low visibility, and give warning signals to help prevent the driver from unintentionally driving off the road.

In accordance with Section 6057 of the ISTEA, NHTSA is conducting a study to evaluate electronic devices that alert truck drivers if a lane change or merge will put their vehicle in the path of another vehicle or object, or if there is a pedestrian in the vehicle's path when backing up. The report on this study is due in December 1993.

NHTSA also is working on a project to develop comprehensive information on any adverse safety effects advanced systems may have on truck drivers. A principal issue presented by this project concerns the ability of the drivers to use these systems safely while driving. The systems being considered include those having to do with data logging, communications, and navigation. An initial report on this project will be completed by January 1995.

ASSESSMENT OF TECHNOLOGIES

Briefly, I would like to reiterate the high priority we give to incorporating IVHS technologies into the highway program. I have already mentioned our National IVHS architecture effort which will stimulate technical innovation by reducing uncertainties to product developers through more precise definition of the functional requirements that must be met.

Another opportunity within the National IVHS Program is defense technology conversion. The tremendous technological resources represented by the people and facilities of the defense industry and the National Laboratories can be applied to

IVHS and can help ensure U.S. leadership in international competition for IVHS development. Capitalizing on the synergism between defense conversion and IVHS technologies will utilize national resources already in place and help bring IVHS systems to the marketplace sooner. Some major defense firms are already involved in various aspects of the IVHS program. Hughes, IBM, Rockwell, and Westinghouse were the companies selected to begin defining the IVHS architecture and participate in operational tests. We are actively striving to attract other defense firms.

We are, for example, participating with the Advanced Research Projects Agency (ARPA) in their Technology Reinvestment Project. The Project's mission is to stimulate the transition to a growing, integrated, national industrial capability which provides the most advanced, affordable military systems and the most competitive commercial products. We worked with ARPA in their recent solicitation to select those technologies that are most promising for IVHS use. We plan to participate with them next year.

CONCLUSION

It is important to note that there is not just one group that represents the diverse interests of IVHS/Commercial Vehicle Operations customers. The States and the FHWA have been very successful, over the last decade, in bringing together government and industry groups to achieve a common objective. The creation of the CVSA, implementation of the Commercial Drivers License program, and initiation of several government-industry panels to achieve uniform programs are prime examples. Because of our grant, oversight, and program responsibilities affecting almost every Commercial Vehicle Operations customer, the FHWA will continue to provide the leadership in bringing these different groups together to maximize the effectiveness of each program, share data and information, and improve motor carrier safety and productivity.

At the outset of my testimony this morning, I discussed the five goals established by Secretary Peña to guide the actions of the Department of Transportation. These goals—to get the economy moving through strategic transportation investments; to make travel safer, more convenient, and more "human"; to ensure that transportation investments will assist our environmental efforts; to advance transportation technology and expertise; and to integrate all modes of transportation into a seamless intermodal system for moving goods and people—will infuse all of our efforts to advance the use of IVHS technology in the motor carrier industry.

I believe that application of IVHS technology to Commercial Vehicle Operations will enable us to create an environment in which the motor carrier industry, and the State and Federal agencies that regulate them, can operate more productively and efficiently. This cooperative effort will ensure the safety of the traveling public so that the traveling experience can be a pleasure for us all.

Thank you for the opportunity to speak to you today about our vision for the Commercial Vehicle Operations portion of the National IVHS Program.

Senator EXON. Mr. Slater, thank you very much.

Mr. Parker, do you have any opening statement?

Mr. PARKER. No, I do not, sir.

Senator EXON. Thank you very much. We will begin the general questioning.

Senator Mathews, since you had indicated that you may have to leave shortly to chair another hearing, I would be glad to yield to you at this time, and then to Senator Burns, for any questions you might have.

Senator MATHEWS. Thank you, Mr. Chairman.

I guess basically my areas of interest, Mr. Slater, on this are essentially the experimental work that is going on now by way of really putting transponders on trucks in order to begin monitoring their whereabouts and location. Some of the early concerns that some of our people in Tennessee expressed was were we really setting up a speedtrap or a speed device here to monitor their speeds, and whether it was going to be used in this manner. And fortunately, I think, after some good bit of discussion, people began to see the real benefits from this as well, and it was not somebody laying in wait.

Other than monitoring the location and the movement of the traffic and so forth, what presently are the benefits that are coming out of that? Now, I know we are looking on down the road at a number of additional things, but what are we doing now, presently?

Mr. SLATER. That is a very good question, and you are correct in noting that early on there were concerns about how the technology might be used. Let me assure you that our objectives are to be sure that it is used for purposes that enhance productivity and enhance safety. That is the primary opportunity that we have when we talk about IVHS technology and its use as it relates to the motor carrier industry.

Some of the benefits that can be derived—No. 1, many of our commercial motor carriers are involved in just-in-time delivery. If they have the benefit of knowing what the traffic conditions are, if they have the benefit of knowing where their vehicles are at any point in time, then they can communicate with their drivers and enable them to avoid congestion. Also, they can provide information that may be of benefit to the driver as that driver moves on a particular roadway—for example, whether to stop at a particular location for gasoline or pick up a shipment.

There may be the ability, as the technology evolves, to communicate with the driver as to observations that have been made regarding the safety of the vehicle's equipment: whether the brakes are actually working properly; whether other equipment is working properly; whether the tires are at an adequate pressure; or whether there has been some shift in the cargo.

The opportunities are really unlimited, but the objectives are to promote safety and to enhance productivity. These are the chief objectives when we think about the use of IVHS technology as related to motor carriers.

Senator MATHEWS. I take it that the experiments so far have been pretty successful?

Mr. SLATER. They have been very successful. And one other point I think could be made is that we view this as a voluntary program. We think that once the members of the motor carrier community see the cost-benefit ratio, that a decision will be made by individual carriers to invest in the kind of technology that will allow them to continue to communicate as they are moving goods on our highways. And the transponders are very reasonable in cost.

When you compare the cost of the technologies to the amount of time lost at an inspection station, when you know that you are in a vehicle that meets all the safety requirements, and when you think about the harm to the environment when you have trucks that are idling because they cannot move smoothly through a check point, I think that the industry will see significant benefits to be derived from voluntary investing in this type of technology.

The States will see a benefit because we can alleviate some of the paperwork, and we can alleviate in many instances the need to build additional weigh stations and the need to hire additional inspection personnel.

So, the opportunities are limitless, and the benefits far outweigh the cost.

Senator MATHEWS. Just one other question, Mr. Chairman. It has got to work this way, but with it being a nationwide program,

I suspect that there will be more than one company producing equipment. Do we have the controls in place to ensure that your equipment works in the Northeast, and that it is going to work in the far West and the Midwest and the South?

Mr. SLATER. That is a major challenge for the overall development of the IVHS program. We are very much involved in the process now to achieve that end. We have recently issued contracts with some of the leading businesses in the country, which have assembled teams to develop an IVHS systems architecture to deal with that very point.

We think that we will come forth with a good product that will allow usage throughout the country. This is a critical issue to be addressed, and we do have an effort underway to meet that challenge.

Senator MATHEWS. Thank you, Mr. Slater. Thank you, Mr. Chairman.

Senator EXON. Senator Mathews, thank you. Senator Burns.

OPENING STATEMENT OF SENATOR BURNS

Senator BURNS. Thank you, Mr. Chairman. I have got to run up to Small Business and be involved in a hearing up there. I have just a couple of questions, and you have already alluded to one of them which is national standards so that these systems can talk to one another. I am glad to hear that you are addressing that, so we have already taken care of that.

What kind of an attitude are you getting from each one of the States? Maybe a State does not want to participate in this program, does it have the ability to opt out or is this going to be something that is going to be nationwide and mandatory on the States?

Mr. SLATER. We want to view the CVO program as one that is voluntary. We think that there are clear benefits to be gained by the motor carrier industry, but we also believe that States, as they look at the continuing growth in the flow of motor carriers through their States, the need for building additional weigh stations, and hiring additional personnel, they too will see the benefit of volunteering to participate in the program.

Now, you are going to hear from some industry representatives today who may suggest that when it comes to the States, it should be a mandatory program. And that is something that is open for debate. But we believe that both States and industry will find that it is to their benefit to participate in the program voluntarily.

Today, the cost of the inspection procedure is in the neighborhood of \$4 billion. This is a cost that is incurred by industry, and by the States. Both have to deal with a lot of paperwork. We think that the whole paperwork and safety inspection process can move a lot more smoothly if we can employ this kind of technology. And we believe that States, as well as industry, will volunteer to participate in the endeavor.

And we are finding a lot of excitement, by the way, on the part of States. I am thinking about the I-75 corridor effort, Senator Mathews, that involves Tennessee and a number of States in the Midwest and how well that is moving forward. We believe that States will continue to respond and will respond favorably.

Senator BURNS. Well, just from this standpoint, everything starts out by saying, "We would sure like to have everybody voluntary—this is a voluntary plan," and then later on it turns into a mandatory plan. I have not been around here very long but I am finding out the drift on that.

This is my last question. I had an opportunity to drive one of those trucks one time. I have done a lot of things in my life. I had to feed the family by hauling cattle down to this guy's State. You know, we just gave our cattle away and sent them into Nebraska, and they made all the money on them. [Laughter.]

We have already appropriated some money. I am on the Appropriations Committee, and we look at these appropriations once the system is devised, and ask if the administration or the Department of Transportation has any idea of what the final cost of this thing will be and who is going to pay for it?

Mr. SLATER. We do not know what the final cost will be because the technology is evolving. We do believe that when you balance the costs for installation, maintenance, and operation that they will be far less than the benefits to be derived from enhanced productivity and safety.

As was noted by Senator Exon in his introductory remarks regarding today's hearing, we have a number of trucks on our highways today moving goods. They are moving them in a way that is productive but can be much more productive.

There is no way we can build ourselves out of the capacity needs that are there, but we can harness technology and use it in such a way as to make the system we have more efficient and more productive. And we think that those benefits will far outweigh the cost of installation, maintenance, and operating such a system as we are discussing this morning.

Senator BURNS. Who is going to pay for it?

Mr. SLATER. The Federal Government will have a role and the States will have a role. But I think that you are going to find the private sector very excited about the potential for this technology, and we have found that there is this cooperative spirit that exists as far as pushing forth its development, pushing forth its analysis. We believe that that same partnership will be there when the time comes for implementation and in meeting the financial demands that will be necessary to do so.

Senator BURNS. Well, I have been very active in telecommunications, and I understand the role that communications is going to play in this. We will be watching this very closely, and how our money is spent, and I think on any oversight we would like to get a report on what is being done.

But I think I know what the American people want right now. What is heavy on my mind is that everybody got their tax bills this week in Montana. We have got a war, we have got a tax revolution going on in my State, whether anybody realizes it or not. So, that is the reason I guess that it would be natural that I would ask those questions.

So, I thank you for coming today. I must apologize, I have got to go to the Small Business Committee, and I thank you.

Senator MATHEWS. Could I make one additional comment?

Senator EXON. Yes, sir.

Senator MATHEWS. I should have clarified what I said on the front end. The groups in Tennessee who were talking about this on the front end, I was engaged at the State level at that time, and they were approaching us saying, "Let us go slow, this could mean all sorts of things."

In advance of this hearing they contacted us to say, let us support it all the way. I mean, they have had enough identification with it and enough experimentation with it. They like the system and they are fully supporting it, and I wanted to make that clear.

Mr. SLATER. Thank you, Senator.

Senator EXON. Thank you, Senator Mathews. Senator Burns has left. I just wanted to, for the record, thank him for sending all those bulls down to Nebraska. [Laughter.]

I would simply add an additional comment: somebody has to take that grass-fed stuff and make it edible so we can make some money on it. That is what we do in Nebraska. [Laughter.]

I just have a question or two, Mr. Slater, and maybe additional questions for the record.

Following up on what Senator Burns and Senator Mathews said, let us talk about funding just a little bit. This year, Congress will appropriate some \$200 million for the IVHS program. Congress has required that commercial vehicle operators or related programs receive at least 5 percent of this sum, or \$10 million.

Do you believe that this overall funding level and the distribution is appropriate?

Mr. SLATER. At this time it is, Senator. As you know, the IVHS program has grown over the years, and this administration has made a new commitment to IVHS technology. But at this time, as we see the program evolving, we believe that the funds that we have available are sufficient. As we move forth, we will continue to be in dialog with members of this committee and with other Members of Congress regarding any additional needs. But at this time, our objective is to use the resources we have and to use them wisely.

Senator EXON. Thank you. Mr. Parker, to get into some of the technical parts of this that are not only complicated but very fascinating, please tell us more about the study due in December to evaluate electronic devices which alert truck drivers if a lane change or merge will put their vehicle in the path of another vehicle or object, or if there is a pedestrian in the vehicle's path when backing up.

Could these technologies be applied to avoiding auto and trespasser accidents involving railroads?

Mr. PARKER. That is an interesting question. We have finished the research that is supporting that particular report to Congress. We are on schedule to deliver that to Congress in December.

We found that the devices that are available today certainly are—I guess you could call them maybe the first generation of those types of devices. We looked at devices that would warn drivers of obstacles in their path and lane changing, and obstacles in their path when they are backing.

The technology that is involved there I believe could be used for the purposes, Senator, that you mentioned. We did not look at that particular question in the study, but we would be happy to make

some comments on that for the record if you would like, or to put in the report something about that.

Senator EXON. That would be very helpful to us as we move ahead on this. I would like to request for you to do that.

Mr. PARKER. Certainly, we will do it.
[The information referred to follows:]

The technology used to alert truck drivers of nearby objects is based on an on-board transmitter that sends a signal (usually ultrasonic or radar), which is reflected off of nearby objects back to a receiver.

The type of technology could not be directly employed to prevent railroad grade crossing or trespasser accidents, primarily because the detection range is relatively short. The engineer would not be able to stop the train in time to avoid any obstacles on the track. Also, because current technology is unable to discriminate between objects on the track and objects waiting near the track, the engineer would receive many false alarms.

Senator EXON. Mr. Slater, let me go into another matter briefly. The subcommittee will hear some testimony this morning from Vorad Safety Systems that the Federal Highway Administration should streamline its procurement procedures for technology projects and enhanced protection of trade secrets. What is your response to these concerns, and what is FHWA doing in this area at this time?

Mr. SLATER. First of all, that is a very important question and it is one that we have to start dealing with at the Federal level as we talk about public-private sector partnerships.

What we are trying to do with the program is not just move forth with the normal contractual arrangement, but a more cooperative partnership arrangement. That means that many businesses do have to provide very sensitive information to us, and we have to be very sensitive to how we deal with that information.

What we are doing now, since we have not had a lot of experience in dealing with these kinds of contractual arrangements or business arrangements is inquiring from States and even from other countries as to how they have dealt with this type of opportunity and challenge over the years. We are taking that information and we are looking at it internally, working with members of the industry and with other Federal agencies so as to come up with the best way of ensuring the kind of protections that you will hear more about today. But it is something that we are serious about and that we are looking at in a very comprehensive way.

Senator EXON. Mr. Slater, the current proposed NAFTA agreement has provisions that would increase the number of Mexican commercial vehicles on U.S. roads. How do you feel IVHS technologies could ensure safety of these foreign commercial vehicles and ease border congestion? Will this be a priority for the Federal Highway Administration?

Mr. SLATER. Mr. Chairman, it will be a priority. I have recently spent time along the border, traveling the entire border from the Texas area, on over to California. I have also spent time on the Mexican side of the border, dealing with this very concern.

It is clear that if we can have automated safety inspections that can make judgments about the condition of a vehicle, about the condition of a driver, and that can feed information to those operating those facilities about the safety records of the driver and the company involved, that this will expedite the movement of goods at

these border crossings, which, all too often, serve as bottlenecks—bottlenecks where trucks come and sit and idle and cause damage to the environment, as well as providing nonproductive time for the drivers and for the companies involved, resulting in increases in prices that are passed on to the consumers.

So, NAFTA will clearly challenge us to use this IVHS technology on the borders, and it will significantly enhance the movement of freight along the borders.

Currently, about 80 percent of the freight moving between Mexico and the United States is moved by trucks. On the Canadian border, it is about 60 percent. So, the use of IVHS technology along the border will clearly have a significant benefit when it comes to measuring the safety of the trucks involved, measuring the weight of the trucks involved and measuring the condition of the drivers involved in driving the vehicles.

Senator EXON. Thank you very much, Mr. Slater.

I will have additional questions for the record possibly for both you and Mr. Parker. We would appreciate your answering those as quickly as possible.

I am now pleased to recognize Senator Hutchison.

Senator Hutchison, I just was advised that you are the new ranking member of the subcommittee, and I am very pleased that you are. That gives you the opportunity to sit higher on the table than you have ever sat before as a freshman. When you come into the subcommittee from here on out, you do not have to pay attention to who is sitting here, this seat is reserved for you.

Welcome as ranking member of the subcommittee. I am pleased to yield for any questions you might have at this time.

OPENING STATEMENT OF SENATOR HUTCHISON

Senator HUTCHISON. Thank you, Mr. Chairman.

I am so daily reminded of my freshman status that I always do go to the end just to make sure that I do not encroach on any of the longstanding rules around here. So, I appreciate knowing my place, and look forward to working with you.

Let me say that I want to thank Senator John McCain for allowing me to be the ranking member of the Surface Transportation Subcommittee. Senator McCain knows of my great interest in this subject, having been a member of the National Transportation Safety Board myself. As a member of the Texas Legislature, I passed the first mass transit bill for Texas, for Houston, and San Antonio. And I was a cosponsor of the bill that reorganized our Texas Highway Department. So, this is an area of interest that I have had for a long time, and I am very much looking forward to being the ranking member.

I want to say that I am very excited about this technology. I live in Dallas. I use the Dallas Tollway, and I have seen this technology in one small part at work. And it is wonderful because being able to use a toll tag rather than stop in the lines that frequently, during the peak hours, are stacked up, the people who have the toll tags are able to zip right through. I can see the savings to consumers every day that I am home in Dallas, because of the people who are having to wait and go through the tolls. If somebody misses the toll with one quarter, then that holds people up even more.

So, I am a real believer in this technology and very pleased to know that it is being pursued by the administration.

I have got a couple of questions, and I know I have been out of the room some, so forgive me if I repeat something. With the money that has been allocated in ISTEA, how much will you be able to do with that allocation, and how effective will that part of bringing the research and development phase in, how long will it take and how much can you actually do with the allocation that you have now?

Mr. SLATER. Senator, we will be able to do a lot with the resources we have now. We will not be able to do everything that needs to be done, but everything that needs to be done does not need to be done right now. We think that the motor carriers area provides the first opportunity for us to deploy IVHS technologies because the industry recognizes it as something of benefit and the cost savings to the public are obvious.

We are moving forth expeditiously to do just that, but we also have some other requirements that have been handed to us by the Congress. One is to produce an automated highway system prototype by 1997. We are moving forth with that. We also have to produce the systems architecture which will allow the various systems to communicate among themselves. We have four teams that are competing to move forth in that effort. And we recently had the meeting to get them started along the way in that process just last week.

We are also expending moneys with the States. Each State has received in the neighborhood of \$50,000 to deal with the institutional concerns relating to commercial vehicle operations that they recognize at the State level. Many of the States have combined with other States so as to give a more comprehensive review of those concerns, recognizing that the institutional problems they may have in their individual States may also be experienced in other States as well.

Furthermore, we recently announced three IVHS centers of excellence. One is Texas A&M University; another the University of Michigan; and the other Virginia Polytechnic University. In conclusion, we are spending the resources, but we are also very careful in the kinds of checks and balances that we have to engage in to ensure that the moneys are being used properly.

Something that will be very important in this regard is the National IVHS Program Plan that we are working on now with the industry. It will take the IVHS strategic plan that we presented to Congress in December 1992 to describe how we will implement those plans. The plan will deal with who is responsible for certain activities and how resources should be spent in order to accomplish those activities.

So, we are moving forth in an expeditious fashion with a degree of care that we think is warranted when you are dealing with these kinds of dollars. We expect to be held accountable. We have an eye on the benefit that will be enjoyed by the public, whether it is in lower cost for goods because they can be moved in a more expeditious and effective fashion, or safer highways because trucks have the benefit of technology that allows them to know when another vehicle is in a blind spot, et cetera.

Senator HUTCHISON. Let me say on a personal note, I am a former advisory board member of the Texas Transportation Institute, which is at Texas A&M, and it does a wonderful so and I am very pleased that Texas A&M is one of the centers for excellence, because they have such a background in transportation issues, and they have been on the leading edge of the new innovations. I knew that they were one of the centers, and I am very pleased about that.

Let me ask you this. In addition to the Federal involvement, obviously this is going to take a real cooperative effort with our State departments of transportation and the industries involved. How are you working to bring everyone in to share the cost, as well as the benefits, in making it as cost efficient as you possible can, while also, of course, exchanging information? How is that working?

Mr. SLATER. Well, the Federal Highway Administration, working with NHTSA and the Federal Transit Administration, has demonstrated, I believe, the kind of partnership that is necessary through our cooperative efforts, that this technology will have benefits that go beyond highways; that it will benefit railroads; that it will benefit transit; that it will benefit a number of safety arenas.

Second, FHWA has always been engaged in building and formulating partnerships to carry out our mission. And in the area of IVHS, it becomes most important because you have to involve the stakeholders not only in the use of a product that can be created, but also in the development of that product. And today I believe you will hear from industry representatives about all that we have done in trying to work with various industry organizations, individual businesses, public and private sector officials and organizations to build the kind of consensus that will be essential in moving IVHS from an idea, a concept, to actual implementation—to a reality that brings about the benefit we know exists if we can meet the challenge of being sensitive to the cost, engaging in the kind of experimentation necessary, enjoying a careful use of public dollars, and also bringing the private sector to the table to move forth with us in partnership to bring about that end.

So, we are working hard, and our being here today hopefully underscores the fact that we see a need to continue to report to Congress as to our actions and endeavors, demonstrating our commitment to be responsible as we seek to move forth and make this a reality.

Senator HUTCHISON. Thank you.

I am very excited about this. I think people often think that technology is for space and aviation, but to see it work for our highways and our surface transportation, which is, after all, our bread and butter in this country, is very exciting to me. And I look forward to working with you to do everything we can to make sure that everybody is coming together, reading from the same page and making the very most of this opportunity that we can.

Mr. SLATER. Thank you, Senator.

Senator HUTCHISON. Thank you, Mr. Chairman.

Senator EXON. Thank you very much, Senator Hutchison.

I am very much interested in your background and knowledge of this subject, and I am looking forward to working with you. And just as an aside, I must tell you that while you are new here, you

have studied hard and you have learned very well, so much so that you, like all of your colleagues, pay no attention whatsoever to the red lights which none of the rest of us pay any attention to anyway. [Laughter.]

So, you have graduated into a senior member very, very rapidly. [Laughter.]

Senator HUTCHISON. Senator Exon, I did not even know there was a red light over there, I am that much of a freshman. [Laughter.]

Senator EXON. Your colleagues have not known there was a red light either. So, I am not singling you out. [Laughter.]

I thank Senator Hutchison for her questions. They were very much on point.

I thank you for the answers. And I would say, Senator Hutchison, I will have some additional questions in writing to the panel members, and if you have additional questions, you may submit those for the record. They will be forwarded to Mr. Slater and Mr. Parker. We would appreciate your answering those questions as promptly as possible so we can include them in the official record.

Mr. SLATER. We will.

Senator EXON. Thank you for being here this morning. Thank you for your good work in moving this exciting program ahead in which we are all very much interested.

Mr. SLATER. Thank you.

Senator EXON. With that, you are excused.

I will call the next panel now. On panel No. 1 are: Dr. James Costantino, the executive director of IVHS America; Mr. James L. Kolstad, the senior vice president of Vorad Safety Systems; and Mr. Kevin Moersch, president of MFS Network Technologies of Omaha, NE.

Also, as an aside, and as I call these witnesses up, I would advise you, Mr. Moersch, that it would not be considered out of order if you made any comment whatsoever about the ranking of Nebraska's football team in the national poll or the record of the Nebraska Cornhuskers at this point in time in the season.

With that, we will have our first—

Senator HUTCHISON. Mr. Chairman, surely I will have the minority right to object to any such reference. [Laughter.]

Senator EXON. See, I told you she learns very, very rapidly. [Laughter.]

Senator HUTCHISON. Coming from the University of Texas, which is not ranked right now, I resent having such a great team represented. [Laughter.]

Senator EXON. That is a point of personal privilege. [Laughter.]

Senator EXON. Dr. Costantino, we will lead off with you this morning. Thank you for being here.

I understand that you are accompanied by Russell Mortenson, the president of Amtech Corp., and Mr. John R. Lister, president of PacTel Teletrac. So, we will proceed in the fashion which I have indicated, starting with you.

STATEMENT OF DR. JAMES COSTANTINO, EXECUTIVE DIRECTOR, IVHS AMERICA

Dr. COSTANTINO. Thank you, Mr. Chairman.

I am James Costantino, executive director of IVHS America or, in its full name, the Intelligent Vehicle Highway Society of America. IVHS America's mission is to coordinate and foster a public/private partnership to make the U.S. surface transportation system safer and more effective by accelerating the development and deployment of advanced technology into that surface transportation system.

IVHS America fulfills its mission through its role as a utilized Federal advisory committee to the U.S. Department of Transportation. In this capacity, we give advice on IVHS activities, we help establish program priorities and we help put together planning of various kinds.

With over 500 participating organizations within our organization, coming from academic, the public sector and the private sector, we are the institutional embodiment of the public/private partnership that will deploy IVHS in the country and, indeed, around the world.

IVHS, in today's jargon, is a model of a working public/private partnership.

Our plans show that deployment of IVHS can reduce traffic congestion by up to 20 percent, and reduce traffic fatalities by up to 8 percent. IVHS will ease points of contact between different modes of transportation, helping make a truly intermodal surface transportation system a reality.

IVHS America projects a \$209 billion IVHS program over the next 20 years. And it is important to note that about 80 percent of that program is expected to come from the private sector and consumer investment, with only 20 percent coming from the Federal Government.

The private sector's role, thus, in this IVHS deployment and development is fundamental. Fulfilling IVHS infrastructure and product needs will create large markets in the United States. However, the potential of IVHS will only be realized with continued Government infrastructure funding. Initial Government investment will encourage private industry to develop IVHS systems and compete in an international market, which is very competitive.

Unfortunately, the \$659 million authorized for IVHS in ISTEA will not lead to deployment of a national IVHS system. That funding applies mainly to research and development and operational testing, and does not address deployment funding.

A difficult barrier for IVHS, and especially commercial vehicle operations, is the many States and agencies who neither coordinate their regulatory information, nor share standard regulatory procedures. Interstate cooperation is necessary to make commercial vehicle operations a reality. And operational tests, such as HELP/CRESCEENT and Advantage I-75 are already helping to tear down these institutional barriers that keep States from cooperating with each other.

IVHS America provides a unique forum for States and projects to discuss their individual and mutual needs among themselves and with the Federal Government and the private sector. Contin-

ued Federal funding and support will further aid the needed interstate and interagency cooperation.

Ways of speeding the deployment of commercial vehicle operations include creating a category of funding within ISTEA that funds CVO development. For instance, creating a corridor program in the Corridors Program devoted to a CVO or commercial network. Standards are another key issue that have been mentioned here this morning that need to be resolved before large-scale IVHS deployment can happen.

The benefits that result from a well administered standards program that ensures compatibility among IVHS system and services include lower product cost, lower deployment risk, lowered liability concern, and higher consumer confidence. There are many existing standards organizations in this country and throughout the world, and it is very important that standards be consolidated and coordinated within this country before we approach international bodies.

The program also serves as a catalyst for increased private sector investment. CVO will only be used widely if it is useful on a national basis, if the same equipment works for motor carriers everywhere they travel.

It is time to put technology to work on our Nation's highways, as we have in other modes of transportation and, by so doing, enable interstate commerce to be as convenient as interstate driving. IVHS means jobs and marketable technologies today, and it is vital to our economic productivity and growth in the years ahead.

However, the national IVHS program is still in its very early stages. IVHS America, the organization that I represent, is only 29 months old. However, continued congressional support is needed to see IVHS through to wide-scale deployment.

At this point, I would like to introduce two gentlemen representing corporate members of IVHS America, who currently market IVHS products of particular interest to motor carriers. They are both IVHS America members. They are Russ Mortenson, president and CEO of Amtech, which is a founding member of IVHS America; and Mr. John Lister, President and Co-CEO of Teletrac.

I am also pleased to mention that on panel No. 2 we will have Mr. Harry Voccolla of Lockheed, who not only is a founding member of IVHS America, but also serves on our board. He has been a leader in defense conversion activities, and we are pleased that he was able to be here with us today.

[The prepared statement of Dr. Costantino follows:]

PREPARED STATEMENT OF DR. JAMES COSTANTINO

INTRODUCTION

Mr. Chairman and members of the Subcommittee, Good Morning. I am James Costantino, the Executive Director of the Intelligent Vehicle-Highway Society of America, or IVHS AMERICA. I am pleased today to discuss the role of IVHS AMERICA in the National IVHS Program and relate how IVHS will both increase the efficiency of our nation's motor carriers as well as enhance the safety of our highway system.

IVHS AMERICA's mission is to coordinate and foster a public/private partnership to make the U.S. surface transportation system safer and more effective by accelerating the identification, development, and deployment of advanced technology. IVHS AMERICA currently has nearly 500 participating organizational members, including the companies represented here today, involving about 3,000 active individuals in the public and private sectors and in academia. Almost 40 percent of IVHS

AMERICA's members are non-traditional transportation organizations, such as national labs and defense and aerospace companies interested in conversion to a civilian marketplace.

IVHS AMERICA fulfills its mission through its role as a utilized Federal Advisory Committee to the U.S. Department of Transportation. In this capacity, IVHS AMERICA gives advice on federal IVHS activities and helps establish program priorities. Our advice is formulated through our 20 technical committees, whose membership consists of volunteers from academia, the public sector, and the private sector.

In its twenty-nine months of activity, IVHS AMERICA has:

- Established a public/private partnership that is the focal point of cooperative IVHS activity in the United States.
- Developed and submitted to US DOT in June 1992, as requested by Congress, the Strategic Plan for IVHS in the United States. This document maps out the optimal development and deployment of IVHS over the next twenty years, recommending a \$209 billion program, 80 percent of which is private sector investment and consumer expenditure.
- Developed and submitted to US DOT in November 1992 the Federal Program Recommendations for Fiscal Years 1994-1995. The plan prioritizes projects and programs for the next two federal fiscal years, recommending a \$512 million federal IVHS program for FY 94-95.
- Established the National IVHS Information Clearinghouse, as required by the IVHS portion of ISTEA. Nearly 5,000 subscribers use the Clearinghouse as a primary IVHS informational resource.
- Developed and recommended to US DOT a multiple team contracting approach for IVHS system architecture development. DOT adopted the recommended approach and is using competitive parallel teams to develop a system architecture framework. The various schemes developed by the teams will be tested and evaluated over a 34-month period, until a single appropriate architecture emerges.
- Developed with DOT a National IVHS Program Plan that makes recommendations guiding the development and deployment of IVHS—a tactical counterpart to the Strategic Plan.

The accomplishments of IVHS AMERICA are representative of the vast amount of work and expertise being given IVHS in the U.S. transportation industry, for our organization depends largely on volunteer work from our member organizations.

IVHS

In general, IVHS uses advanced computer, electronic and communications technologies to address the problems of the entire surface transportation system. Many of these technologies have in the past advanced other modes of transportation, such as aviation and rail. Applying these technologies to highway transportation enables us to maximize the efficiency of the current surface transportation system. Our own plans show that deployment of IVHS can, by the year 2011, reduce traffic congestion by up to 20 percent and reduce traffic fatalities by up to 8 percent.

IVHS is more than making cars and highways "smarter", however. IVHS will ease points of contact between different modes of transportation, helping make a truly seamless, intermodal surface transportation system a reality. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) calls for a test track for an Automated Highway System to be operational by 1997.

Many IVHS operational tests and early deployments around the country are already demonstrating the benefits of applied IVHS technology. The FAST-TRAC project in Oakland County, Michigan has reduced rear-end collisions in its area by 30 percent and has reduced travel time in its equipped corridors by up to 11 percent. In Los Angeles, an Advanced Traffic Management System has, since its 1984 installation, cut daily commuter time by 50,000 hours, reduced vehicle traffic light stops by 8 million, lowered fuel consumption by 13 percent, and lowered exhaust emissions by 26 percent. An economic analysis of the benefits of this system concluded that they exceeded costs by a ratio of 38:1. This system is currently being expanded to include over 3800 more intersections in the Los Angeles area, which will result in an annual savings of \$60 million and 10 million hours of travel time and delay. The current expansion is expected to cost \$256 million.

The bulk of federal funding for IVHS is through the 1991 Intermodal Surface Transportation Efficiency Act, which authorizes \$659 million in funding for IVHS R&D and operational testing through 1997. The Clinton Administration has added \$345 million to the IVHS program over the period 1994-1997. For Fiscal Year 1994, the Senate recently recommended over \$211 million in funding for IVHS, including \$10 million for CVO.

Simply stated, the goals of the National IVHS Program are to increase the efficiency and safety of our surface transportation system. These goals have direct implications for the motor carrier industry, or, as we refer to it in the IVHS community, Commercial Vehicle Operations (CVO). In addition to Advanced Traffic Management Systems, which help urban areas deal with congestion problems, and Advanced Traveler Information Systems, which ease travel by giving drivers access to information that allows them to plan the most efficient route to their destination, IVHS systems specific to CVO will increase safety, expedite deliveries, improve operational efficiency, and improve incident response. These benefits aid not only motor carriers, but also the agencies that regulate them, the average surface transportation user, and the consumer.

A number of CVO systems will apply IVHS technology to improve driver and vehicle compliance with motor carrier safety regulations:

- Hazardous Material Information Systems—Electronic HAZMAT tracking technologies are being developed that would improve capability for cargo monitoring by providing enforcement and incident management response teams with accurate information on cargo contents, through the use of electronic placards, load-monitoring, and selective automatic vehicle location.

- Automated Real-Time Safety Verification—Such systems include interconnected systems of roadside enforcement stations with access to safety records; roadside driver, vehicle, and motor carrier safety status verification; and on-board safety monitoring systems.

Of the Senate's recommended funding for CVO in FY 1994, \$3.5 million is suggested for a project establishing an advanced information processing system to enhance the enforcement activities of the Motor Carrier Safety Assistance Program (MCSAP). The Senate Transportation Appropriations Subcommittee envisions a system that would be a first step toward implementing real-time safety record systems, by networking several information systems together to provide information within seconds on the safety rating, roadside inspection, and crash record of a motor carrier, as well as the status of a specific commercial driver's license. The Subcommittee directed FHWA to have the initial phase of such a system in place at 100 MCSAP inspection sites before 1996, and recommended that this system be compatible with the National IVHS Program Plan that FHWA and IVHS AMERICA are currently developing on the CVO program.

Other proposed CVO applications and systems are directed at improving the timeliness, efficiency, and accuracy of motor carrier operations. Improvements are achieved by automating existing manual procedures, electronically capturing and reporting data, and improving the flow of information between carriers and regulatory agencies and between operators and dispatchers. The improved efficiency comes from simplification or elimination of efforts required by motor carriers to comply with various regulations—without compromising regulatory oversight—and from overall improvements in fleet management. Electronic systems will reduce the expense and effort required by a motor carrier to comply with state licensing and reporting requirements. The states will likewise benefit from more efficient program administration, better enforcement of state requirements, and a higher level of carrier compliance with state regulations. Enabling systems include:

- Electronic Credentials—Enabling a motor carrier to electronically file for, obtain, and pay for all required licenses, registrations, and permits. A supporting database will contain information about those transactions for access by appropriate government agencies.

- Automated Credential and Weight Checking—An electronic system that can automatically check carrier credentials and clear transponder-equipped vehicles through ports of entry and weigh stations at highway speeds will potentially provide substantial savings to both commercial operators and regulators. Road-to-Vehicle communications allow the integration of data that is needed to determine if a carrier is in compliance with state requirements. If the credentials are in order, a vehicle need not stop. Weight information from high-speed mainline Weigh-In-Motion devices will also be transmitted.

- Automated (Electronic) Toll Collection—This expands on the technologies and facilities of automated vehicle identification and classification. By prepaying tolls and displaying a tag, vehicles would be able to drive through toll areas without stopping.

- Fleet Management—Systems that provide real-time traffic information and vehicle location to dispatchers and facilitate intermodal transfer would reduce driver delay and help operators avoid congestion or other traffic incidents.

A key CVO goal is the creation of "transparent" state and international borders. This will be achieved in part by automating the collection of information required by regulatory agencies. Such benefits are enhanced further if the information can be shared by several states. By expanding the information collected, carriers will gain access to information essential for managing their fleets, and governmental agencies will obtain information they can utilize for planning purposes. Current CVO operational tests are forming the beginning of such a system, called the "National Commercial Vehicle Network". The network would link I-75, HELP/Crescent, and I-80 to begin a nationwide expansion of a fully automated network that would allow trucks to move as freely as cars. The network would be built around several key "service areas", such as safety, credential and reporting processes, size and weight screening, hazardous material monitoring and response, fleet management, and cross-border truck transportation.

Accurate, standardized regulation of the motor carrier industry is a key to the safety of our surface transportation system. However, the current cost of regulation is substantial to both government and the trucking industry. States spend \$5 billion annually to license vehicles, collect fuel taxes, and issue permits. Carriers spend another \$2 billion annually for the paperwork associated with those tasks. States spend more than \$100 million a year for truck weight enforcement alone. The interstate motor carrier industry spends millions of hours annually waiting for weight and safety inspections, toll collections, and port-of-entry checks. Productivity gains from improved fleet management and efficient traffic management are essential to the quality and competitiveness of U.S. transportation, business, and industries at the local, national, and international levels.

DEPLOYMENT

IVHS AMERICA projects a \$209 billion IVHS program over the next twenty years. 80 percent of this investment is expected to come from private sector and consumer investment. The private sector's role in IVHS is fundamental. Fulfilling IVHS infrastructure needs will create large markets. These needs include sensors and actuators, beacons, and hardware and software for electronic toll collection, traffic management, and vehicle control systems. The defense buildup has caused companies not usually part of the surface transportation industry to look to these markets to sell their technology. Firms such as Westinghouse, Hughes, TRW, Raytheon, and Lockheed have all become active members of IVHS AMERICA in the expectation that IVHS will provide a market for their products and expertise.

However, the potential of IVHS will only be realized with continued government infrastructure spending, particularly in the area of Advanced Traffic Management Systems (ATMS). ATMS is a building block on which most other functional areas of IVHS rely. Initial government investment will encourage private industry to develop IVHS systems and compete in an international market.

Unfortunately, the \$659 million authorized for IVHS in ISTEA will not lead to deployment of a national, seamless IVHS system. That funding applies mainly to research and development and operational testing, and does not address the issue of deployment. Mr. Chairman, the largest problem inhibiting mass deployment of IVHS is not research-oriented. Most IVHS technologies, especially the ones specific to CVO, are already available. Rather, IVHS faces many institutional problems that must be overcome before it can be fully deployed. Because deployment of IVHS and development of a competitive U.S. IVHS industry go hand-in-hand, this is a key issue for the future of the national IVHS program. Consequently, Congress must find a way to encourage states and localities to deploy available IVHS systems. Deployment problems which Congress could address include institutional issues, funding issues, and standardization.

The most difficult barrier for IVHS, and especially CVO, is the many states and agencies who neither coordinate their regulatory information nor share standard regulatory procedures. Interstate cooperation is necessary to make CVO a reality, and operational tests such as HELP/Crescent and Advantage I-75 are already tearing down the institutional walls that keep states from cooperating with each other. IVHS AMERICA also provides a unique forum for states to discuss their individual and mutual needs among themselves and with the Federal Highway Administration and with equipment users and suppliers. We will continue to foster such cooperation through our role as a utilized Federal Advisory Committee. Federal leadership and funding support will also be needed to ensure that states are encouraged to cooperate in the deployment of IVHS.

States should also be encouraged to use their limited Federal-Aid Highway funds to operate and maintain IVHS systems. At this point, IVHS deployment depends on visionary state agencies using funds to build and maintain IVHS systems in addition to the limited funds available under the Federal-Aid Highway Act.

tion to roads and bridges. There is no incentive to do so, and so naturally most states continue to do business as usual. The cost of doing business as usual is severe in both the problems generated by congestion and safety issues and in the time and investment lost to our foreign competitors in an exciting and emerging high-tech field. Mr. Chairman, the United States cannot afford either the economic costs of increasing congestion or losing yet again the potential to lead the world in a high-tech field. An excellent way of speeding the deployment of CVO would be to create a category of funding within ISTEA that funds CVO deployment; for instance, creating a corridor in the corridors program devoted to the National CVO Network. Once funding becomes available for deployment, institutional issues between states will be easier to overcome. In its recommendations for FY 1994, the Senate Appropriations Committee stated that "the Committee seeks the widest participation of the States in the program. To expedite progress, FHWA may use an array of administrative mechanisms, including grants to the states, to accomplish the objectives of the CVO component of the National IVHS Program."

Standards are another key issue to be resolved before widespread IVHS deployment can happen. ISTEA specifically calls for "the development of standards and protocols to promote and ensure compatibility in the implementation of IVHS technologies." DOT has contracted much of its standard-setting mandate to IVHS AMERICA, which has taken the lead in coordinating and promoting the development and use of consensus standards in the IVHS program. As the standards making process progresses, Federal support of the program must keep pace with its development.

Numerous benefits result from a well-administered standards program that ensures compatibility among IVHS systems and services on regional, national, and international scales. These include lower product cost, lower deployment risk, lowered liability concern, and higher consumer confidence. In doing so, the program also serves as a catalyst for increased private sector investment. Mr. Chairman, CVO will only be used widely if it is useful on a national basis—if the same equipment works for motor carriers from California to Massachusetts. This is another challenge in the development of the National Commercial Vehicle Network—a challenge that can be overcome with continued work by both the private and public sectors.

Mr. Chairman, IVHS is more than a fascinating intellectual exercise for transportation engineers and planners. It is time to put technology to work on our nation's highways, and by so doing, enable interstate commerce to be as convenient as interstate driving. IVHS means jobs and marketable technologies today, and is vital to our economic productivity and growth in the years ahead. However, the National IVHS Program is still in its early stages. Continued Congressional support is needed to see IVHS through to widespread deployment. Mr. Chairman, your committee can help by encouraging the use of IVHS technologies in all safety and regulatory issues as a means of increasing the efficiency of the motor carrier industry for both motor carriers and their state regulators.

Thank you for your time. I would be pleased to answer any questions you might have.

Senator EXON. Thank you very much, Dr. Costantino.

Mr. Mortenson, please continue.

I would remind all of you that any written statements have been included in the record. We would appreciate you summarizing your statements at this time.

Mr. MORTENSON. Yes, sir.

STATEMENT OF G. RUSSELL MORTENSON, PRESIDENT AND CEO, AMTECH CORP.

Thank you, Senator Exon and Senator Hutchison.

My name is Russ Mortenson. I am president and CEO of Amtech Corp., headquartered in Dallas, TX, with our research, development, engineering, and manufacturing operations in Albuquerque, NM.

Today, you have requested some consultation and input on what sort of Federal action can be taken to maximize America's benefits from and industrial competitiveness worldwide in the IVHS sector. We at Amtech feel that especially qualified to consult with you on

this subject since we are one of the most experienced U.S. companies today doing large-scale, practical application of IVHS technologies around the world.

You have already heard from Dr. Costantino in his oral testimony and in his written submission that the largest problem which is inhibiting IVHS deployment is not research oriented. In fact, most or many IVHS technologies are already available in one form or another. Rather, as Dr. Costantino said in his statement, IVHS faces many institutional problems before it can be fully deployed.

At Amtech, we agree with that.

Dr. Costantino categorized those areas or those problem areas that Congress could help in three areas: institutional issues, funding issues, and standardization. So, here today, I would like to recommend two specific steps that the Federal Government could take, which will greatly enhance and speed IVHS deployment.

First, you could assist in helping the Federal Highway Administration establish an open, nonproprietary standard for communications protocols for automatic vehicle identification technologies based on the standard developed and recently adopted, just last year, by the State of California.

Second, we would like to see the Congress adopt a set of incentives, tied to Federal highway funding to the States, targeted to provide widespread, and I underline widespread, public/private partnerships to finance IVHS deployment initiatives from the private sector.

Amtech's background—we started the company in late 1984 as a technology transfer from the Los Alamos National Laboratory in Los Alamos, NM. In fact, today, Amtech is probably the outstanding paradigm example of a successful technology transfer from the national laboratory system into the private sector. Today, we employ 400-plus scientists, engineers, and various business people. Our systems are deployed worldwide in many countries. We are the 15th fastest growing, last year, publicly held company, and second fastest growing U.S. export company. About 30 percent of our sales today are export.

Our goal as a company is to assist in the optimization of the utilization of the surface transportation network. We are an electronics company, but our business is surface transportation optimization.

In the discussion about standards, it is important to note that there are various standards already in place for various modes of surface transport. These include by the American Trucking Association, the International Standards Organization, the American National Standards Institute, the Association of American Railroads, the International Air Transport Association, and the European Union of Railways. All of these organizations have already—and they are user organizations—have gone through the process of adopting standards for automatic vehicle or automatic equipment identification on all modes of surface and even air freight transportation. All of the standards are compatible with and based on Amtech's technology.

This morning, I have the opportunity to give you a couple of real world examples of what we are doing in the IVHS arena on a commercial scale today. With your permission, Mr. Chairman, I would

like to demonstrate, or show, a flip chart that I have, and then we have some equipment here that we can very briefly demonstrate to you.

Senator EXON. Mr. Mortenson, you have some flip charts and some video?

Mr. MORTENSON. These are just photographs. No videos, just photographs.

Senator EXON. OK, thank you.

Mr. MORTENSON. Mr. Chairman, here is a photograph of a speeding locomotive, as you see. Since the previous segment of the hearing had to do with railroads, I think this is also relevant. Here you see an Amtech reader system, right here, which identifies tags that look like this that are mounted on the rail vehicle. And what that does, of course, is identify the vehicle and its precise location at a given moment in time.

Senator EXON. If I understand it correctly, that piece of plastic, or whatever it is that you just held up, would be affixed to, with instrumentation in it I assume, that locomotive and other locomotives would have the same thing, but different identification data. Is that what we are getting at here?

Mr. MORTENSON. Yes. In this particular case, Mr. Chairman, the North American railroads, under the aegis of the Association of American Railroads, made the decision to implement this technology universally in North America. We are in the process right now of affixing these electronic transponders to every rail vehicle circulating on the continent. So, by the end of 1994, it will be possible to track every locomotive and rail car moving across the United States, Canada, and Mexico.

Senator EXON. Now, it is not just when that train goes over a certain point; there are readers all over. Therefore, the location of that locomotive within, what, yards or miles, could be identified?

Mr. MORTENSON. Exactly. There are planned to be some 5,000 detection sites across the United States. Obviously, that has high implication for tracking of things like hazardous materials, as well.

Senator EXON. This would be tied in with the switching control facilities of all the railroads; is that the way it would work?

Mr. MORTENSON. Absolutely. We are building 3 million of these right now for the North American rail fleet.

Senator Hutchison earlier alluded to electronic toll collection in Dallas. This is an antenna array on the toll plaza there which allows for nonstop electronic paperless toll collection. Of course, in this barrier environment, which is a traditional way to collect tolls, you are not able to move at highway speeds.

My personal record in driving through here is about 90 miles an hour. [Laughter.]

I hope no one from the Texas Turnpike Authority is here to hear me say that. Which is a little scary, but it works fine.

This is a similar operation on the Lincoln Tunnel up in the New York City area, where buses move through the Lincoln Tunnel, again, nonstop and automatically. And here is the way it is moving now.

Now, the tag, or the toll tag, becomes the primary means of revenue collection. This is the Kilpatrick Turnpike, one of 10 Oklahoma turnpikes where our technology is operative today. They call it Pike

Pass in Oklahoma. Here the drivers are allowed to drive at highway speeds, and again our spec here is 90 miles an hour.

The readers are mounted on overhead sign bridges. There is a feedback signal for the driver here. If they want to pay conventionally, they have to stop at a little toll booth rest stop and then merge back into traffic. After 2 years, we have over 250,000 users, including many, if not all, of the major trucking fleets across the United States that use the Oklahoma system. This is a nonstop port-of-entry system at the border with Oklahoma and New Mexico.

In terms of intermodal, and Dr. Costantino was talking about all of these devices are compatible, so they cover the marine container environment, the trucking environment, as well as the open highway environment.

And then, finally, air cargo. Our first large-scale implementation here happens to be Japan Air Lines, and it is a pleasure to see something made in the USA on the side of every JAL cargo container.

So, with that, I would like to just take a moment, Mr. Chairman, and show you a little bit how this works. We have a simple reader system antenna set up here. The reader electronics are in a box over in the corner there. We have a green light in this corner, which basically signifies the kind of feedback signal that a highway driver might see in the event of passing one of these nonstop points, either on a toll road or at a port-of-entry situation.

And then, behind you, we have a little character sign that will display the data that is presented to the computer. And I have got two or three examples of tags here that I would like to offer to you. And if you would just like to take this out of the bag. And if you will orient it a little bit toward the antenna there, which is the way it would be presented. There, you see the green light.

[The technology referred to was demonstrated.]

Mr. MORTENSON. It only comes on once, because if you are paying a toll, you only want to pay once.

Behind you, you see the data that happens to be programmed in that particular tag.

We have a couple of other examples here. And, again, here we see we are a proponent of standards, as you have heard from my testimony today. And here is one that is especially relevant to Nebraska. I understand that it is Indian for Nebraska.

And this is another message that we can all appreciate.

And then, finally, I have one here, of course, for my home State senator, Senator Hutchison.

And, again, the transponder has read it and it is over there.

So, Senator, we urge the Congress to consider the actions that we recommend in terms of standards and creating true public/private partnerships to help us in industry deploy this technology on our network. We are prepared to make the investment if the State and local regulatory environment is conducive to it.

Thank you.

[The prepared statement of Mr. Mortenson follows:]

PREPARED STATEMENT OF G. RUSSELL MORTENSON

INTRODUCTION

I am Russell Mortenson, President and Chief Executive Officer of Amtech Corporation. I joined Amtech as its President in 1987.

Thank you for the opportunity to demonstrate Amtech's state-of-the-art technology and to show you how its application in the IVHS area is significantly improving our standard of living.

You have today solicited comment on what Federal action should be taken to maximize America's benefits from Intelligent Vehicle Highway Systems (IVHS). Amtech is one of the most experienced U.S. companies in the market today in the practicable, commercial application of IVHS technology. Based on our experience, we believe that well-considered Federal action is needed to enhance the use of IVHS technology for the commercial transportation sector, as well as the public at large. Specifically, I want to recommend to you that the Federal Government take the following steps:

- Set an open, national standard for communications protocols for Automatic Vehicle Identification (AVI) technology for Electronic Toll Collection and Traffic Management, Commercial Vehicle Operations (CVO), and other IVHS applications. This standard should be based on the most advanced standard available, the open-protocol standard designed to promote competition among the industry and developed and adopted for state wide use by the California Department of Transportation.
- Promote IVHS public/private partnerships on a wide-spread scale as innovative means of financing our nation's infrastructure needs.

IVHS is a reality today—already in use in various applications in hundreds of cities and states across the country. However, its full potential—connecting our cities and states—can best be realized with some Federal Government involvement. I welcome this Subcommittee's initiative and am ready to assist you in any way possible in this effort.

AMTECH, FROM NATIONAL LABORATORY TO COMMERCIAL SUCCESS

Today, Amtech is the world's leading technology provider of automatic equipment and vehicle identification systems for the transportation and intelligent vehicle highway systems markets. Headquartered in Dallas, Texas, we design and manufacture an American product in Albuquerque, New Mexico, and incorporate it into customized hardware and service solutions for a multitude of private transportation companies and public customers worldwide.

The following organizations have all already set their own standards for Automatic Equipment Identification (AEI), and we are proud to say that each of them is based on Amtech technology:

- The American Trucking Associations (motor carriers)
- The International Standards Organization and the American National Standards Institute (intermodal freight containers)
- The Association of American Railroads (all railroads in Mexico, Canada, and the United States)
- The Union Internationale Des Chemins de fer (railroads in over 32 European countries)
- The International Air Transport Association (air freight containers)

Today, IVHS and Amtech have proven to be a commercial success.

Only ten years ago, however, Amtech's radio frequency identification technology was an infant technology being developed at Los Alamos National Laboratory. Originally developed to control access to the nuclear facilities of the Department of Energy and for the electronic identification of animals, the technology was transferred in late 1984 under a Department of Energy program to five Los Alamos scientists who formed Amtech with the help of one-half million dollars in "seed" money from a Dallas investor. After a lot of hard work and over \$60 million in investment, Amtech now employs approximately 400 scientists and engineers, as well as manufacturing, marketing, and software development personnel. About 28 percent of our sales last year were export sales, including sales to Japan, Mexico and other Latin American countries, as well as Europe. We are a small business but world leader in our field and are considered an ideal example of the privatization and commercialization of national laboratory technology.

In light of Amtech's government roots and our role today as a leading provider of this technology to the public, I feel it is our duty, as well as an honor, to be able to contribute, to the extent industry's input is appropriate, to developing policy for our country on issues which affect the future of IVHS.

HOW AMTECH'S RADIO FREQUENCY IDENTIFICATION TECHNOLOGY WORKS

Amtech's modulated backscatter system.—I am demonstrating for you today Amtech's modulated backscatter system. The key hardware elements of the system are the reader and radio frequency (RF) modules, as well as the antenna; the tag, which is programmed with a unique identification code and other information relevant to the customer's application; and computer systems to operate the equipment and to process the information being communicated via the system. In 15 one-thousandths of a second, the following process takes place to identify the tagged item:

- (1) The reader system transmits an unmodulated, low-level signal toward the tag.
- (2) When a tagged object or vehicle enters the zone in which the signal is being broadcast, the tag detects the signal, modifies it to include its unique identification code, and reflects it back to the reader, modulating it and transmitting the information programmed in the tag to the reader. Note that the tag itself does not generate an RF Signal, but is completely passive and does not add to electromagnetic pollution levels. Together with the signal from the RF, the system design negates the necessity to synchronize the RF signal and the passage of the tag, and allows tags to be read at high speeds.

- (3) The antenna receives the modified signal and transfers it to the RF module, which demodulates and pre-amplifies it, and sends it forward to the reader.

- (4) The reader, which is microprocessor-based, receives the signal from the RF module, decodes the tag data code, adds the time and date of the tag reading, and relays it to a host computer for subsequent use in identifying and monitoring the tagged object, or for activation of peripheral equipment.

We have added a variable message sign to our demonstration today to simulate what an operator would see on his computer screen.

INTELLITAG VEHICLE-ROADSIDE COMMUNICATION (VRC) SYSTEM

Amtech systems run from simple solutions to sophisticated world-wide networks. Customer choices range from basic functionality to advanced read-write systems that permit two-way Vehicle-Roadside Communications (VRC) on a real-time basis, where data is read from and written to vehicles remotely-and at highway speeds. Amtech's IntelliTag can provide non-stop, electronic toll payment in both "open barrier type and "dosed" ticket-type toll systems, and can be used to enable complex, dynamic road-pricing or congestion-pricing strategies.

Using the modulated backscatter process, the systems components are the On-Vehicle unit (or "tag") and the Roadside Communicator Unit (RCU). The RCU consists of an antenna, an RF transceiver (transmitter/receiver) module, and a read/write transaction processor ("the reader"). Data processing devices may also be linked to the system, either at the roadside or via telecommunications to a network of reader and RF transmitter/receiver modules.

When a tagged vehicle approaches the system, a presence detector turns on the RCU, which sends out a single-frequency RF signal. Once again, the signal is reflected from the tag and returned to the antenna, along with the tag's identification and other encoded data in a simple modulation of the original RF signal. However, in this system, the RCU also now determines the data to be written back into the tag, and begins to transmit the write command, addressed specifically to the tag just read. A strengthened RF signal switches the tag into a mode for receiving the new information. The new information is then written to the variable memory portion of the tag. The system verifies that the process has taken place correctly and that the newly stored information is accurate. All of this takes place in only a fraction of a second.

DYNICASH, ELECTRONIC CASH WITH PRIVACY

One of the newest innovations in Amtech technology now permits, for the first time ever, users of IVHS technology to pay tolls in complete privacy and with a high degree of security. A recent Louis Harris survey shows that 53 percent of Americans are very concerned about their privacy. This is the first time in 23 years, the poll says, that a majority of Americans have had such privacy concerns. Amtech has just introduced DyniCash, smart card technology using data encryption technology to prevent the tag or card identity of the user from being revealed during the payment process. At the same time, DyniCash's special "tamper-revealing" firmware allows the toll or road operator to catch any attempted fraudulent transaction and the individual making the transaction. This new smart card can also be the patron's electronic cash for other related applications, such as payment of parking fees, vending machines, pay phone, and other point-of-sale transactions where coins or bank notes

have traditionally been used. DyniCash is safer than cash and can be used in a variety of settings.

HOW AEI TECHNOLOGY STANDARDS BENEFIT COMMERCIAL VEHICLES

For tracking and monitoring.—AEI technology allows transportation operators, such as commercial trucking or busing operations, to keep track of their chassis, trailers, and other equipment on a real time basis. With reader systems set up at strategic locations, such as at entrances to warehouses or switching yards, trucking operations can make more efficient use of their high-valued assets, maximizing their use and monitoring maintenance and operations schedules, and providing better service to their end customers.

However, to be successful, truckers must be able to interface with other important components of our multimodal transportation network. They are in the business of moving cargo and must therefore interexchange equipment with railroads, shipping lines, and aviation carriers to meet their customers needs. Because compatible standards for AEI now exist in all these sectors, equipment travelling through several modes of transportation can be identified and tracked in real time across the entire comprehensive network of transportation carriers. Economically, these standards provide a seamless intermodal transportation network and allow any one segment to be internationally competitive.

For electronic revenue collection.—In the revenue collection environment, this technology provides a faster, cleaner, safer, more efficient, more secure, means of collecting government or commercial user fees.

Automatic equipment or vehicle identification (AVI) technology allows commercial vehicles, such as trucks or buses, to pay road use fees without stopping and without having to carry cash. As electronic toll collection is of increasing interest to cities and states as a means of relieving congestion and facilitating the flow of traffic, commercial vehicles using these systems and equipped with AVI tags can make better time without long toll lines. They also reduce the wear and tear on engines otherwise caused by the repeated stopping required at manual collection points. Without vehicles with diesel engines constantly stopping and starting, resulting pollution levels can be lowered. In a study presented at the International Bridge Tunnel & Turnpike Association in 1991, Steven Wolf and Alice Lovegrove also concluded that introducing electronic toll collection can help improve air quality and avoid violations of the new Clean Air Act Amendments of 1990.¹

With this technology, the public at large will benefit from safer highways. We have all experienced drivers who suddenly weave from lane to lane looking for the shortest toll line. This behavior inevitably increases accident rates on highways. Statistics kept by the Oklahoma Turnpike Authorities revealed a much better safety record on turnpikes equipped with Electronic Toll collection systems. During its first year of operation alone, Oklahoma authorities reported no traffic accidents in the electronic collection lanes, while there were 71 accidents in the cash lanes.

Due to its ability to increase the integrity of the collection system, cashless electronic toll collection (ETC) has been known to result in higher revenues than had been experienced previously with cash collection methods. At the airport in Los Angeles, where Amtech systems are in operation, authorities have found that they are not only able to monitor the dwell-time of commercial vehicles in the crowded terminal area, thereby reducing congestion and pollution, but they have also been able to reduce the amount of the user fee by almost one-half and still collect more than two times the revenue.

Elmer Johnson, former Executive Vice President and Director of General Motors Corporation, has written in a new publication from The American Academy Of Arts and Sciences, "Avoiding the Collision of Cities and Cars,"² that congestion is a top public concern and that, "In its sophisticated forms, congestion pricing uses these ETC technologies to impose differential fees for auto and truck travel, depending on location and time of day. It provides an almost infinitely flexible approach for dealing with the level of congestion in and around our central cities." He notes, correctly, that in the United States, we have not yet taken full advantage of these kinds of sophisticated congestion pricing tools. Johnson has concluded that "Because it targets users, congestion pricing would be considerably more cost-effective than fuel-price increases as a means of reducing congestion."³ While congestion pricing

¹Wolf, Steven and Alice Lovegrove. Toll Plaza Design to Minimize Right of Way Distances and Carbon Monoxide Levels. Philadelphia, May 20, 1991.

²Johnson, Elmer W. Avoiding the Collision of Cities and Cars: Urban Transportation Policy for the Twenty-first Century. Chicago: American Academy of Arts and Sciences. Sept. 1993; pp. 16-17.

³Ibid., p. 48.

is not necessarily the most appropriate tool for all locations, nor will it be without some controversy, the new IVHS technology makes its use more acceptable and more "user friendly", where it is deemed essential.

One key benefit of electronic toll collection is that it stretches tax-payer dollars by reducing significantly the costs of collection and making more efficient use of existing highways and infrastructure. After installing electronic toll collection equipment, one of Amtech's customers, the Oklahoma Turnpike Authority, saved so much on their costs of operations that they were able to reduce the toll charged to patrons of the electronic system by one-third. The Los Angeles Airport Authority was similarly able to lower its access fee to the airport, while at the same time significantly reducing the congestion levels at the terminal and improving the flow of taxi and other commercial vehicle traffic. Other customers have found that toll lanes equipped with our electronic collection systems are able to handle up to ten times the traffic of cash collection lanes. Therefore, public authorities find that they can handle more traffic with the existing number of lanes, spend less on the most expensive and most intrusive means of expanding infrastructure (concrete and steel) and reduce the need for expanding the right of way.

As primary users of these roads, commercial vehicles will be among the most significant beneficiaries of the new technology.

As I mentioned earlier, standards for Automatic Equipment Identification have significantly benefitted freight transporters the world over. However, unlike the freight transportation arena, there are no national standards, for electronic revenue collection or state port of entry by-pass systems. A trucker making his way across country, could in the future encounter several incompatible, unrelated electronic toll collection or port of entry systems. Just as truckers once had to have license tags from every state, truckers now might need a series of different proprietary tags to utilize electronic toll collection systems in the various localities through which he passes. If no national standards are set, his use of these systems will be selective and the benefits of the new technology will be reduced.

What's more, without national standards, the growing number of entrants to this industry will spread their development resources over the widely varying, hand-tailored requirements increasingly being specified by the numerous users interested in this new technology. Rather than increasing the quality of the product and thus the benefits to the public, these divergent requirements simply end up re-inventing the wheel each time.

If research and development efforts can be focused, it will also certainly result in better products. With a strong industry at home and with growing global demand, U.S. industry can count on being a continued leader in the global implementation of automatic vehicle identification technologies. Setting national standards for fundamental elements of such systems will allow users to reap the benefits of economies of scale and thus less expensive systems.

The California Department of Transportation (Caltrans) has taken a leadership role in the right direction. After extensive investigation, including testing and advice from Lawrence Livermore National Laboratory, and a number of public hearings, California has adopted state-wide standards for automatic vehicle identification for initial implementation in electronic toll collection. This standard is based on an open, non-proprietary protocol, stimulating competition within the industry. By allowing industry to focus its resources, California has increased the stakes for competitors and ensured themselves a choice of compliant equipment for their system.

In setting a standard, we should also ensure that it does not make present installations obsolete. It should provide for upward compatibility, so that agencies which have invested early in the benefits of AVI are not required to throw out their existing systems and be victims of "reinventing the wheel." Rather, we want to encourage choice at all levels and allow existing users to upgrade their systems as it becomes possible and desirable.

I am not suggesting that one company be chosen as the supplier of choice for America. Neither am I suggesting that the government supplant the market in determining what the standard should be. The word done by California to arrive at an open, non-proprietary solution reflects the best of the marketplace while taking into account the public interest as well as the user agencies. We should take advantage of it in setting our own national standard.

America's transportation needs are urgent. Setting national standards, in consultation with industry, users, and other concerned individuals and key interest groups, like IVHS America, the Federal Government can accelerate wide-spread adoption of one of the most promising solutions we have. We will continue to work with the Department of Transportation, which has already done a great deal of good work in this regard, in following up its mandate from the Intermodal Surface Transportation Efficiency Act of 1991.

I strongly urge the Congress, the Department of Transportation, and others concerned to give the highest priority to the development of a national standard based on the California standard and other relevant work done to date.

FOR COMPLIANCE WITH GOVERNMENT SAFETY, ENVIRONMENTAL AND OTHER REGULATIONS

I have already mentioned the use of this technology in meeting higher safety and clean air requirements.

There are several other possible uses of the technology that need Federal Government, state and local government cooperation, if we are to fully explore their potential. What if, for example, through electronic identification, trucks carrying hazardous materials could be monitored and checked automatically for compliance with local and other governmental regulations? The technology exists for the tag to contain precise information regarding the content of the trailer and for integrating electronic identification with sensors that can report pressure or temperature of the inside of the trailer. In the event that a truck carrying hazardous material turns over on the beltway, the rescue squad could determine the contents of the trailer by reading the tag from a distance, minimizing possible risk to themselves and others from exposure. What is needed is for government regulators to set standards and rethink the regulatory system to take full advantage of this new technology.

The Federal government can set a good example by using IVHS technologies where appropriate in carrying out its own responsibilities. On the border, for example, innovative customs procedures making use of AVI technology can bring new efficiencies to the shipment of cargo from one country to another. Commercial trucking operations equipped with electronic AVI license plates and railroads equipped with electronically-sealed container tags could significantly improve their performance with new, paperless border entry procedures for customs, integration and the host of other transport regulations which must be implemented at the border. If, as one of our customers has told us, AVI tags can cut down gate processing time at trucking yards by 75 percent, think how much time AVI can save commercial transport operations—and their customers—at border crossings. In light of the importance of exports to the United States, and in particular to U.S. commercial vehicles using surface transportation, this technology offers sizeable economic benefits to the whole economy. What is needed is a review of our border processes and the methods used for implementing them, to update them and incorporate this new technology. This is a role only the Federal Government can play.

These are but two of the many areas in which this technology can enhance the effectiveness of government regulatory efforts. It may require rethinking the Federal role in transportation; it will certainly require cooperation shepherded by the Federal Government between our many levels of government. Without Federal Government initiatives in these areas, we are missing a significant opportunity to achieve better, more efficient infrastructure for all our users.

HOW THE FEDERAL GOVERNMENT CAN PROMOTE INNOVATIVE FINANCING METHODS FOR REACHING OUR GOALS

Public/private partnerships have been a favorite theme in the past—often talked about, but seldom taken seriously. Such arrangements can bring benefits to all.

We feel that Amtech's installation in Dallas on the North Tollway is an excellent example. Before state funds were available for improving the toll collection facilities in Dallas, Amtech offered to install its system on the Dallas Tollway at no cost to the local authorities, with no technical or capital risk for the Texas Turnpike Authority. In return, Amtech was permitted to charge a small fee (5 cents) for each user transaction. Tags are rented to tollway motorists who voluntarily decide to utilize the system. Motorists who choose not to use the electronic system are not, of course, charged for this added voluntary option. Patrons pre-pay their electronic accounts, eliminating any possible credit loss to the system. The toll revenues collected, minus the extra nickel per transaction, are turned over daily to Texas authorities.

As a result of installing this system on the Dallas North Tollway, the toll authorities have been able to reduce rush hour by 45 minutes. The tollway has become a much more commuter friendly environment for patrons, and Amtech's investors have made a reasonable profit. Dallas "Tolltag" users have increased from 10.5 thousand in the fall of 1989 to over 60 thousand in 1993. This public/private partnership has been a highly effective commercialization of a traditional government function. Amtech and the Texas Turnpike Authority were recognized in 1990 for innovative highway finance with an award from the U.S. Department of Transportation's Federal Highway Administration for the Dallas North Tollway installation.

More such arrangements are possible. They are needed to supplement the limited State and Federal money available for effectively revitalizing our existing national infrastructure. Alone, no government in America, including the Federal Government, has sufficient funds for the improvements which are needed in our transportation networks. To help make up the gap, we might consider more effectively leveraging the mandate provided for IVHS in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) by attaching incentives or conditions for instituting such partnerships when using ISTEAs funds.

The current legal environment for implementing such partnerships is too constraining. Federal, state, and local laws and regulations should be reviewed with a view toward adjusting the regulatory environment appropriately. Focussing first on the most promising projects, we should begin making these partnerships work for us.

Conclusion

To summarize, Amtech believes that leadership by our Federal Government is necessary if we are to benefit further from the new IVHS technology. As Elmer Johnson said about an analogous situation, "Technology-forcing policies have generally been made at the federal level, and properly so. Fifty different state-mandated technologies for automobiles would destroy the automotive industry."⁴ The IVHS industry is in a similar situation.

We hope that serious consideration will be given to accelerating the work being done on setting a national standard for automatic vehicle identification and that, in rethinking the Federal Government's role, serious consideration can be given to the forging of new public/private partnerships which might allow us to make progress quickly.

IVHS technologies can reduce congestion and enhance safety. Johnson emphasizes that, "While caution is in order, and though many elements are not presently cost-effective and thus will not be deployable for years, the promise is sufficiently great to warrant a vigorous research and development program and a strong political commitment to sustain it."⁵ Here, too, the Federal Government can play a significant role.

There is much work to be done. Amtech has embarked on a pioneering journey and has seen the potential benefits ahead. We would like to participate in a cooperative effort with our Federal and local governments to ensure that we reap the benefits we know are possible.

[Miscellaneous letters and information from Amtech may be found in the committee's files.]

Senator EXON. Mr. Mortenson, thank you very much. It is a very interesting presentation. Let the record show that Texas continues to ignore the red light. [Laughter.]

Mr. Lister, you will be next.

STATEMENT OF JOHN R. LISTER, PRESIDENT AND CO-CEO, PACTEL TELETRAC

Mr. LISTER. Yes, thank you. I would also like to thank you for the opportunity to talk about PacTel Teletrac. I would also like to say that I am a resident of California, a former resident of Texas, but I am going to avoid the red light, I believe.

PacTel Teletrac is a company that offers fleet management solutions to a wide variety of transportation and service oriented companies. Our product line consists of basically four capabilities. One, an accurate, high-capacity location capability or technology. Two, data messaging capability, which allows information to be sent to and received from vehicles.

No. 3, fleet management software which features digitized maps which allows for the location of the vehicle to be presented on an

⁴Johnson, p. 13.

⁵Ibid., p. 32.

ordinary PC screen. And finally, security devices which greatly enhance the security of both drivers and cargo.

Teletrac is a very cost-effective system offering inexpensive hardware and service pricing, which makes it affordable and applicable to a wide variety and sizes of companies from the very small to the very large. We are currently operating in six cities, Los Angeles, Chicago, Detroit, Dallas-Ft. Worth, Miami, and Houston.

And now I have a 2-minute video that I would like to show you that demonstrates the capability.

[A videotape was shown.]

Senator EXON. Mr. Lister, let me ask for a clarification. The system which allows a car or the driver of that car out on that highway is what, a radio signal of some kind that is on the car which receives a signal if you want to indicate that there was an accident or security problem?

Mr. LISTER. Yes, sir. In each vehicle a transponder or transmitter is installed.

Senator EXON. On every automobile?

Mr. LISTER. Yes, and it sends signals to cell sites, land-based cell sites which are positioned around the area. And the cell sites receive the signal, and through some sophisticated software compute the location of the vehicle and display that at a dispatch center, put on the map.

Senator EXON. What are the frequencies proposed for operation? Also, how many of the cell sites do you have to have? Is it every 10 miles, 20 miles, 1 mile?

Mr. LISTER. It depends upon the terrain and the kinds of obstructions that are involved. At this time, it is mainly an urban oriented system and it takes anywhere from 20 to 30 cell sites to cover a large urban area.

Senator EXON. So, an urban area the size of Washington, DC, could be covered in most instances by 20 or 30 cell sites; is that correct?

Mr. LISTER. Yes, sir. We would also include Baltimore in that, and that would expand the number of cell sites to get total coverage.

Senator EXON. Thank you. Gentlemen, thank you very much. We will hold questions, if that is all right with you, Senator Hutchison, until we finish the panel.

Senator HUTCHISON. That is fine.

Senator EXON. Next will be Mr. Kolstad. Mr. Kolstad, welcome back before the subcommittee. It has been a little while. We are always glad to have you back.

STATEMENT OF JAMES L. KOLSTAD, SENIOR VICE PRESIDENT, VORAD SAFETY SYSTEMS, INC.

Mr. KOLSTAD. Thank you very much, Mr. Chairman, Ms. Hutchison. It is a pleasure to be here in my new capacity as senior vice president of Vorad Safety Systems, which is a company headquartered in San Diego, CA.

Vorad is the Nation's largest manufacturer of radar collision warning systems for commercial vehicles. These safety systems represent the Nation's first widespread commercial installation of an IVHS vehicular onboard radar to combat traffic accidents in-

volving buses, trucks, and recreational vehicles. Greyhound Lines has installed this system on its entire fleet.

We appreciate the opportunity to participate in these hearings, Mr. Chairman, and I hope that our experience and thoughts will be useful to the committee.

You will be seeing a very brief video on the Vorad System following my testimony, but here basically is how it works. Vorad provides forward-looking vehicle detection capabilities that monitor closing rates and distance between the host vehicle with the system and vehicles in its path. An audible tone is sounded if the closing rate is hazardous based upon speed and distance factors.

The system also measures the distance between the host vehicle and another vehicle in its path based upon safe following distances, alerts the driver if he or she is too close to avoid a collision if the vehicle in front were to stop quickly. Greyhound, for example, has set 5 seconds as the optimum distance.

A second antennae, this one here, is positioned in the driver's blind spot, on the right side of the vehicle, to warn of vehicles traveling in that area. A red light mounted near the outside mirror, this little device, illuminates to indicate the presence of another vehicle and an audible tone sounds if the system detects an unsafe condition when the driver activates the turn signal.

The system has a crash recording capability that continually records the last 10 minutes of vehicle activity including speeds, brake applications, targets, and steering wheel movements. With this recording ability, the system also stores a variety of other kinds of information that helps management determine driver behavior and vehicle economics.

Research on this system actually began more than 10 years ago and has involved many technical challenges over the years and design changes prior to perfecting the product for volume production. Moreover, it has been done without a cent of taxpayer revenue.

It happened because of the entrepreneurial vision and financial support of the Allstate Insurance Co. But the funding of research projects with long-term paybacks can impair both growth and business competitiveness for small innovative companies. For that reason, we would like very much to take advantage of revenue sources for projects involving public and commercial transportation safety that clearly are in the national interest.

Indeed, such support is outlined among the principles of the DOT's mission in developing a national IVHS program. We think such support can be a springboard for U.S. industry's pursuit of technological excellence or a prescription for corporate failure and a hindrance to technological progress.

To date, for Vorad safety systems that support has been either unavailable, impractical, or unwise. I want to emphasize that the IVHS technological environment makes no allowances for laggards, and the competition to harness the most advanced technology is nothing short of urgent.

For that reason, we think changes are warranted in the Federal Government approach to grant for IVHS purposes. Specifically, we would like to suggest three improvements which we think would generate progress, assist in assuring the United States captures and maintains a leadership role in global IVHS technology, and

provides for a more timely and thoughtful process in the dispensing of Federal funds.

First, streamline the grant process for other than designated corridor demonstration projects to ensure that fund distribution begins no later than 120 days after a contractor receives proposal approval. As the lead DOT agency responsible for coordinating the Department's IVHS program the Federal Highway Administration and its predecessor agency, the Bureau of Public Roads, have almost eight decades of experience in administering programs focused on highway and bridge construction in which leadtimes are not usually critical.

Moreover, recipients of these grants have typically been large, established companies. In contrast, much of the IVHS research, development, and deployment of new technology systems and equipment is currently being done by very small companies far from even the bottom of the Fortune 500 list.

These small companies, utilizing highly skilled and motivated personnel, are capable of reacting quickly to changes in regulations, technology, and market demand. They however do not have the ability to manage staff and respond to projects that will not realistically be funded for as much as a year later. More importantly, the fact is that in a year the project may well be eclipsed by newer technology, the marketplace, or competition.

Second, rewrite the Department of Transportation's regulations governing trade secrets, confidential business information pertaining to matters before NHTSA and NHWA. Current rules and regulations of the DOT are inadequate to properly protect proprietary and technical information relevant to IVHS projects which the Department may wish to fully fund or cost share. And in our opinion, failure to overhaul and strengthen these rules is progressively going to limit the entrance of potential qualified applicants.

The biotechnical and pharmaceutical industries have flourished in part because rules and regulations of the Food and Drug Administration are much more sensitive and reflective of these concerns.

Finally, establish within the Office of the Secretary of Transportation a mechanism to ensure that highway safety projects receive priority for funds designated for IVHS.

The IVHS benefits umbrella is a large one ranging from increased efficiency and convenience to improved productivity, to lower pollution, to better emergency response, to the saving of lives. Not all of these benefits enjoy the same priority for attention or funding.

We believe it is no accident that the DOT's No. 1 goal, as stated in its IVHS strategic plan is "to improve the safety of surface transportation." The two stated objectives are, one, to reduce significantly the number of annual fatalities and injuries due to accidents, and two, to improve the safety of private vehicles, transit fleets, commercial vehicles, and hazardous material movement.

Clearly, the preservation of lives and reduction of injuries is sound public policy as a priority, and the appropriate place to make those determinations we think is the Office of the Secretary.

That completes my statement, Mr. Chairman. If I could show a 2-minute-and-40-second video, I think it might give you a better idea of how the system works.

[A videotape was shown.]

Mr. KOLSTAD. Thank you.

[The prepared statement of Mr. Kolstad follows:]

PREPARED STATEMENT OF JAMES L. KOLSTAD

Good Morning. My name is Jim Kolstad. I am senior vice president of VORAD Safety Systems, Inc., which is headquartered in San Diego, California. VORAD is the nation's largest manufacturer of radar collision warning systems for commercial vehicles. These safety systems represent the nation's first widespread commercial installation of an IVHS vehicular on-board radar to combat traffic accidents involving buses, trucks, and recreational vehicles. Greyhound Lines has installed this system on its entire fleet.

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Additionally the system has a crash recording capability that continually records the last ten minutes of vehicle activity including speeds, brake applications, targets and steering wheel movements. With this recording ability the system also stores a variety of other kinds of information that helps management determine driver behavior and vehicle economics.

Research on this system actually began more than ten years ago and has involved many technical challenges and design changes prior to perfecting the product for volume production. Moreover it has been done without a cent of taxpayer revenue. It happened because of the entrepreneurial vision and financial support of the All-state Insurance Co.

But the funding of research projects with long-term paybacks can impair both growth and business competitiveness for small innovative companies. For that reason we would like very much to take advantage of revenue sources for projects involving public and commercial transportation safety that clearly are in the national interest. Indeed such support is outlined among the principles of the DOT's mission in developing a national IVHS program. Such support can be a springboard for U.S. industry's pursuit of technological excellence or a prescription for corporate failure and a hindrance to technological progress.

To date, for VORAD Safety Systems, that support has been either unavailable, impractical or unwise. I want to emphasize that the IVHS technological environment makes no allowances for laggards and the competition to harness the most advanced technology is nothing short of urgent.

For that reason, we think changes are warranted in the federal government approach to grants for IVHS purposes. Specifically we would like to suggest three improvements which we think would generate progress, assist in assuring that the United States captures and maintains a leadership role in global IVHS technology, and provides for a more timely and thoughtful process in the dispensing of federal funds.

1. Streamline the grant process for other than designated Corridor demonstration projects to insure that fund distribution begins no later than 120 days after a contractor receives proposal approval.

As the lead DOT agency responsible for coordinating the Department's IVHS program, the Federal Highway Administration and its predecessor agency, the Bureau of Public Roads, have almost eight decades of experience in administering programs focused on highway and bridge construction in which lead times are not usually critical. Moreover, recipients of these grants have typically been large established companies. In contrast, much of the IVHS research, development and deployment of new technology systems and equipment is currently

being done by very small companies far from even the bottom of the Fortune 500 list. These small companies utilizing highly skilled and motivated personnel are capable of reacting quickly to changes in regulations, technology and market demand. They however, do not have the ability to manage, staff, and respond to projects that won't realistically be funded for as much as a year later. More importantly, the fact is, in a year the project may well be eclipsed by newer technology, the marketplace or competition.

2. Rewrite the Department of Transportation's regulations governing trade secrets and confidential business information pertaining to matters before the National Highway Traffic Safety Administration and the Federal Highway Administration.

Current rules and regulations of the Department of Transportation are inadequate to properly protect proprietary and technical information relevant to IVHS projects for which the Department may wish to either fully fund or cost-share. In our opinion, failure to overhaul and strengthen these rules is progressively going to limit the interest of potential qualified applicants. The biotechnical and pharmaceutical industries have flourished in part because of rules and regulations of the Food and Drug Administration that are much more sensitive and reflective of these concerns.

3. Establish within the Office of the Secretary of Transportation a mechanism to insure that highway safety projects receive priority for funds designated for IVHS.

The IVHS benefits umbrella is a large one ranging from increased efficiency and convenience to improved productivity to lower pollution to better emergency response to the saving of lives. Not all of these benefits enjoy the same priority for attention or funding.

We believe it is no accident that the DOT's number one goal as stated in its IVHS Strategic Plan is: "to improve the safety of surface transportation." The two stated objectives are "1. To reduce significantly the number of annual fatalities and injuries due to accidents" and "2. To improve the safety of private vehicles, transit fleets, commercial vehicles, and hazardous material movement." Clearly, the preservation of lives and reduction of injuries is sound public policy as a priority and the appropriate place to make those determinations is in the OST.

That completes my statement Mr. Chairman. I would be pleased to respond to questions.

Senator EXON. Mr. Kolstad, thank you very much. Mr. Moersch, we would be glad to welcome your comments at this time.

STATEMENT OF KEVIN P. MOERSCH, PRESIDENT, MFS NETWORK TECHNOLOGIES

Mr. MOERSCH. Chairman Exxon, members of the subcommittee, thank you for this opportunity for us to address the crisis of America's service infrastructure.

Senator Exxon, I think it is easy to understand why so many of the people in the group today have a hard time stopping for red lights, since they used to watch our Big Red on the move each week. [Laughter.]

Senator EXON. I got that.

Mr. MOERSCH. As depicted by this diagram, and as I think that you have already heard in the discussions earlier today, and I believe each of you have a copy of this, IVHS is not an individual technology or even an individual system. More importantly, it is a collection of overlapping technologies and overlapping applications.

In fact, the only responsible approach to implementing IVHS requires a comprehensive and a very cohesive systems approach for all uses and all users. There has been a lot of discussion this morning on commercial vehicle operations as different from toll operations, but they are really one and the same. IVHS applications and technologies will affect commercial operators, commuters, travelers, tourists, and we must address all of them with one common system and one common technology.

Another crucial reality is the leverage between this surface infrastructure and our Government's, if not our Nation's, requirement and goal for a national information superhighway and infrastructure. As you will notice, the physical network itself is virtually a 100-percent overlap, if you will. And if we lose sight of this, I think we will waste millions, if not billions of dollars in trying to implement either of these approaches individually.

But what we do not want to lose sight of either is the fact that our goal in all of this is to deliver improved safety, increased mobility, reduced congestion, improve energy efficiency, minimize the environmental impacts of new roads and the cars on them, improved economic productivity—all aimed at improving both the preservation and the quality of life.

But as was previously mentioned, standardization is essential. We must leverage past, current, and future investments in the surface infrastructure and in the technology that has brought us this far. We must look at a universal architecture, however. We no longer can support some of the attributes of permutations of individual company's development efforts. We must look forward and not backward selecting this standard.

Somewhat of a controversial position—America's infrastructure cannot be supported functionally or economically by utilizing underamortized, overengineered, overpriced, and often obsolete defense technologies—nor by narrowly focusing on some of the “pioneering” and limited technologies that have brought us this far through some of the existing CVO and AVI pilot programs. Quite frankly, that is how we all end up with \$1,500 toilet seats and hammers.

Today we all have an option. We must look for commercial technology implementation as the only real requirement for the industry.

This block diagram depicts a modular and commercial implementation. Very similar to the tags that you saw previously, the base tag is something very simple, very small, and very compact. It serves the entire function for toll applications. It also serves as the foundation to implement the expanded or enhanced applications of CVO that are depicted by the two blocks adjacent to it.

As all of the people have said here today a common architecture and common interoperable standard is essential.

What Mr. Mortenson referenced as a nonproprietary and open architecture is also essential. We cannot support individual vendor preference or bias, nor do we want to exclude any vendors, no matter how small or large. We must support all AVI applications through a common standard, and as I mentioned earlier, whether the application is for commercial vehicles, electronic toll, traffic management, registration, or even security and access.

Standards also allow us to take a future safe approach to implementing the IVHS technologies of tomorrow. They provide us the ability for expandability, allow us to promote competition, and allow competitors—the vendor community—to differentiate themselves through enhanced applications, price, schedule, and service. It will allow America to put its infrastructure system on the leading edge and it is a concept fully supported by a number of the major companies here today, as evidenced by the presentation by

Amtech, their partners, Motorola, MFS, and our partners, Texas Instruments.

Our approach, as depicted by this next slide, in a commercial vehicle application is to provide all of these applications on a common infrastructure supported by a common AVI technology. If you look at this picture of a commercial vehicle operation, and now at the next slide where that same physical facility has been enhanced to include the toll application and operation as well, you will notice that there is no replacement of anything. It is purely the incremental addition of new applications onto the same facilities, providing the leverage that is necessary for all of us to affordable priced tag that you have heard about here today.

Whether it is \$200 million or \$200 billion, it is crucial that we maximize the benefit received for our investment. It is also important that we be able to do it on a fixed schedule and a fixed price basis.

The congressional action that we are supporting here today is to promote and continue with further creative funding flexibility, to truly push public and private collaboration on these projects, to provide a national information policy, which is also essential for getting the leverage between these two infrastructure networks, and to support the FHWA's move toward standardization.

But most of all, we must involve the private sector. Let competition in the vendor community fund development not the Government. We must emphasize commercial implementations rather than continue with pilot projects. The time is now.

The next slide shows a potential opportunity for a very interesting test rather than just a pilot program and one based on a commercial application. The State of Iowa has invested \$100 million building a statewide fiber infrastructure. This infrastructure could support a comprehensive IVHS program test, one that could be done with minimal incremental investment and maximum results.

Another commercial implementation—Kiewit, our parent company, has invested in State route 91 in southern California where they and their partners, COFIROUTE from France, are putting up \$120 million in private investment, debt, and development moneys along with MFS technology to enhance the existing SR-91 freeway infrastructure without 1 cent of public funds.

All of these opportunities create the foundation for the future, allow us to abandon the rhetoric and the incompatibility of the existing pilot programs like the HELP/Cresent and Advantage I-75. We hope that Congress will work with us to this end.

Thank you.

[The prepared statement of Mr. Moersch follows:]

PREPARED STATEMENT OF KEVIN P. MOERSCH

INTRODUCTION

Mr. Chairman and members of the Subcommittee, I am Kevin P. Moersch, President, MFS Network Technologies, Inc. I am honored to testify today on developments in Intelligent Vehicle Highway System ("IVHS") technologies, their applications to commercial vehicle operations and their role in solving some aspects of the transportation crisis facing the nation. A review of current transportation issues imparts the urgent need to resolve critical problems such as reduced highway safety, increased pollution and traffic congestion, reduced energy efficiency and lost productivity. Conventional solutions of the past such as developing changeable traf-

fic flow techniques, securing toll collection systems and building wider roads are not only ineffective but also are too costly to solve today's problems. Congress recognized the important role of IVHS technologies in the Intermodal Surface Transportation Efficiency Act ("ISTEA") of 1991 authorizing \$660 million for IVHS over six years. Although IVHS technologies cannot resolve all the transportation system problems facing the nation, ivHS can provide the foundation for bringing America's transportation system into the 21st century. IVHS technologies will support and complement our transportation infrastructure and convert an antiquated, deteriorating and costly system into a highly efficient, safe, low cost, environmentally responsible and productive transportation network. It is with this vision that MFS Network Technologies has invested in the development of cost-efficient IVHS technologies that can accommodate complex commercial applications as well as assist in improving traffic flow, vehicular safety, and the nation's quality of life. MFS Network Technologies believes that its IVHS technology will:

- improve safety conditions on the roads;
- increase mobility and reduce congestion;
- reduce environmental hazards while increasing energy efficiency; and
- improve economic productivity.

MFS Network Technologies commends this Subcommittee for recognizing the significant role that IVHS technologies can play in solving the nation's transportation problems and once again thanks this Subcommittee for the opportunity to describe the technologies we have developed and their associated commercial applications.

What is IVHS and how does it work?

Let me explain the key components of the "smart highway system," as IVHS has come to be known, and then I will explain the potential benefits that it can provide.

IVHS systems are composed of several technologies and subsystems including information processing, communications, control and electronics. These include radio frequency identification, normally in the form of Automatic Vehicle Identification ("AVI"), passive and active highway sensors and monitors, closed circuit television, fiber optic networks, variable road-side message signs and various levels and types of computer systems, to name only a few. These basic elements can be integrated to create subsystems that provide Electronic Toll and Traffic Management Systems, Electronic Toll Collection Systems, Advanced Traveler Information Systems, Commercial Vehicle Operations Systems, Automatic Vehicle Identification Systems, and Motorist Messaging Systems, among others.

The best known IVHS subsystem is Electronic Toll Collection and in particular its main component, AVI, which uses radio spectrum-based technology to identify, and in some applications communicate interactively with, individual vehicles. This identification technology can be used by toll agencies to assess automatically toll fees based on individual vehicle type, weight, speed, number of axles and, if desirable, time of day, day of the week, and traffic-sensitive measures. For example, a car or truck equipped with a credit-card-size communication service transponder travelling at high speed on a highway equipped with an Electronic Toll Collection system would pay tolls as follows:

- a sign over the highway informs the driver how much he or she will have to pay to utilize toll express lanes which are equipped for Electronic Toll Collection;
- sensors in the pavement signal the AVI subsystem and tollway computers that a vehicle has entered the toll zone;
- an antenna/transceiver overhead or in the pavement emits radio frequency signals and makes contact with the AVI transponder in the vehicle;
- the transceiver relays the vehicle's unique identity to the control center antenna, where a centralized computer deducts the toll from the driver's prepaid or credit account;
- other roadway and roadside sensors and monitors measure weight, speed, axles and profile allowing for flexibility in toll rate differentiation;
- surveillance cameras record all activities and, specifically, capture the license numbers of vehicles without AVI tags. Those vehicles that pass through the toll express lanes without appropriate AVI tags, i.e., vehicles that "jump" the toll, can be intercepted by police or fined by mail;
- video cameras linked by a fiber-optic line along the length of the tollway enable facility managers to keep track of traffic and decide whether to raise or lower tolls, as appropriate;
- non-express toll lanes will remain available for vehicles without AVI tags to pay tolls through traditional means.

As IVHS technology advances, vehicles will have devices on the dashboard that communicate through the AVI tag to transmit "real-time" instant information on traffic conditions such as accidents, vehicle breakdowns, or planned road work; weather and road conditions such as ice, fog and snow warnings; and suggested al-

ternate traffic routes to bypass traffic slowdowns or dangerous driving conditions. This basic transportation communications system opens up incredible opportunities to evaluate and control the flow of traffic, track hazardous materials, and improve emergency vehicle response time on our nation's highways.

AVI and other IVHS technologies can also play a key role in making truck transportation safer and more productive. Using IVHS technologies such as AVI, Automatic Vehicle Classification and Weigh-in-Motion to Commercial Vehicle Operations applications, a truck travelling on a smart highway could be weighed and inspected just once on an interstate trip. With protocol standardization, crossing state borders would no longer require trucks to stop because each state's AVI antenna/transceiver would read a vehicle's AVI tag, relay the information to a regional or national computer database and use the data entered into the database at the truck's starting point to determine whether the truck must be reinspected at any point along an interstate trip. MFS Network Technologies' "Type 3" AVI tag, co-developed by MFS Network Technologies and Texas Instruments, will accommodate the storage of additional information that would enable trucking companies to pay any applicable state taxes and fees electronically as they cross state borders, and to monitor and manage their fleets from remote locations. This technology can even be applied to create electronic log books, which would ensure accurate reporting of highway driving time.

Commercial vehicle and fleet operators are also interested in the use of AVI subsystems as a means to download maintenance and operational information from on-board computers and other equipment at terminal and maintenance locations. Such information might include inputs from on-board engine and vehicle diagnostic equipment, fuel and fluid level measuring sensors, and odometer readings. Similar interest exists in the use of two-way AVI communications capabilities as a means to upload cargo manifests, permits and the like to on-board computers. State governments also recognize the potential for commercial vehicle AVI subsystems to be used in the automatic collection of fuel taxes, weight and distance-use taxes, permitting fees, excess weight fines and other revenue sources.

Let me give you an example of how AVI technology, developed jointly by MFS Network Technologies and Texas Instruments, can be used in the trucking industry to increase the productivity and safety of fleets. For example, a Werner Company truck, equipped with an MFS Network Technologies' AVI transponder, travelling from Omaha to Chicago could pay tolls, taxes and weigh-in at the port of entry of each state between Nebraska and Chicago without stopping (except for driver exercise, meals and rest), if that truck is travelling along a smart highway. To accomplish all of these functions, with what is little more than a credit-card size tag, before leaving Omaha the fleet manager would input into a Nebraska centralized computer database the manifest and destination of the truck, the weight and the intended route. The Nebraska centralized database would relay the data to the centralized database of each state that the truck will transit. As the truck travels along the highway, the various transceiver locations will read the tag, interface with each state's centralized database and record information such as speed, weight and the tax rates for each state. The centralized computer would compute taxes and tolls as the truck or other commercial vehicle enters and exits each state along the pre-programmed or alternate route, and debit the taxes and tolls from a pre-paid or credit account. Other technologies such as advanced traffic management systems, traveller information systems, and advanced vehicle control systems will help avoid, reduce and manage congestion on highways, resulting in improved delivery times, reduced fuel consumption, and increased cost-effectiveness and greater safety on America's highways.

MFS NETWORK TECHNOLOGIES' COMMITMENT TO THE TRANSPORTATION INDUSTRY AND IVHS TECHNOLOGY

MFS Network Technologies is a premier telecommunications network builder and manager as well as systems integrator. In addition to co-development of our AVI subsystem with Texas Instruments, our team of professionals have designed innovative and state-of-the-art IVHS technology and systems that are currently in use in various parts of the country.

MFS Network Technologies is one of four operating subsidiaries of MFS Communications Company, Inc., whose majority owner is Peter Kiewit Sons', Inc. As one of the largest privately held companies in the country, Peter Kiewit Sons' is a diversified, multi-national corporation with substantial interests in construction, mining, engineering, telecommunications and energy. With over \$2 billion in consolidated annual revenue and a net worth well in excess of \$2 billion, Peter Kiewit Sons' is staffed by over 4,000 professionals and employs almost 10,000 craft and trade em-

ployees. It operates a fleet of more than 12,000 pieces of equipment valued at over \$1 billion. MFS Network Technologies' research and development endeavors in telecommunications technologies are supported by its relationship with other MFS Communications Co. subsidiaries, which provide fiber optic-based, competitive access, switched services and native rate Local Area Network connectivity to long-distance telephone companies, government agencies and all sizes of business customers.

In March 1993, Peter Kiewit Sons' announced that it would build and be part-owner of one of the first private toll roads and the first all Electronic Toll Collection/AVI toll roads in the United States. Peter Kiewit Sons', in partnership with COFIROUTh of France, owns the California Private Transportation Company, O.P., who will build an express lane toll facility coexisting with State Route 91 (SR-91) in Southern California. MFS Network Technologies will provide the Electronic Toll and Traffic Management System for the collection and management of tolls along with a comprehensive array of traffic management and control subsystems. The Electronic Toll and Traffic Management System will include the following components:

- *Automatic VehicLe Identification (AVJ)* (with Texas Instruments Radio-frequency Identification Systems (TIRIS) Group)—a radio frequency communication system in which one end, the transponder located in the vehicle, consists of a transmitter, receiver, data storage and processor. Specific vehicle identification information is stored on the transponder. The other end of the radio frequency link is the roadside AVI reader, which consists of a transmitter, receiver, digital section and digital interface into an external computer typically called a Lane Controller;
 - *Violation Enforcement System*—video cameras will record vehicles without a tag that cruise through the AVI express lanes to avoid paying the toll;
 - *Video Transaction Data Multiplexer (VTDM)*—a technology that provides a toll agency with an inexpensive yet evidentiary method of compiling integrated video and digital transaction documentation on every event for every transactions for every vehicle in every lane;
 - *Microwave Vehicle Separator*—a microwave-based detector device designed to determine how closely vehicles may safely travel at high speeds under varied weather and road conditions;
 - *Lane/Plaza/Control Computers*—these various computers intake data from the various Electronic Toll Collection subsystems, process the data and maintain a record of account data;
 - *Traffic Management System*—this system includes highway surveillance closed circuit television cameras along the length of the highway as well as vehicle detection systems that will provide information on the traffic densities, speeds and surveillance of the highway for safety purposes;
 - *Fiber Optic Communication System*—a fiber optic communication system is provided along the complete length of the highway. This system is used to transmit video surveillance and other traffic information along the highway back to the control center;
 - *Telephone System*—this is a local telephone system connecting toll facilities. In addition the system interfaces into the local telephone network;
 - *Two-Way Radio Communication System*—this mobile radio system provides communication from the toll road control center to law enforcement agency vehicles. This system can also be used for communications between vehicles and the commercial vehicle operator;
 - *Variable Message Signs*—the variable message signs along the road-side are computer controlled and provide variable messages to the driver as the vehicle moves along the highway;
 - *Control Center*—the control center is the terminal point for the toll collection and traffic management system. All of the computer equipment and computer functions take place at the control center, e.g., the AVI computer, the variable message sign computer and other subsystem computers;
 - *Roadway Lighting*—MFS Network Technologies is designing the roadway lighting to assure that the correct light levels are available for the closed circuit television video camera used for violations enforcement;
 - *Power*—the toll system requires standby diesel generators and Uninterruptable Power Supplies to provide AC power to the system if the prime power source from the local power grid fails.
- This multi-million dollar, long-term investment demonstrates the commitment of MFS Network Technologies and its partners to the future of IVHS and to the benefits IVHS will bring to the American public.

A NATIONWIDE SEAMLESS TRANSPORTATION NETWORK MUST BE CREATED

Realizing the full promise of IVHS technologies, particularly commercial vehicle operations applications need no longer be a daydream. The technology is here, the time is now. MFS Network Technologies believes that Congress has a critical role to play in making the reverie of an intelligent highway infrastructure a reality. Congress must encourage the creation of and access to centralized databases that will serve as clearinghouses for information on commercial vehicles transiting through each state. Congress also must serve as the architect of a national information Infrastructure highway. Such a highway would allow a Werner Company truck travelling from Omaha to Chicago to make available to every state's centralized database system through which the commercial vehicle travels the cargo manifests, vehicle weight data, route manifests, time and other data and information entered by the fleet manager at the starting point of the trip. Once all of the permits, clearances, fees and tax payments are confirmed electronically by each state, the information would then be relayed to an AVI transponder on the vehicle which would relay all the data to transceivers along the highway as the truck travels from state to state.

As envisioned by MFS Network Technologies, the creation of an information superhighway and national database clearinghouse is critical to realizing the full potential of IVHS technologies and commercial vehicle operations systems. A national database clearinghouse would:

- connect state and regional database facilities; and
- establish processes/procedures to allow transfer of commercial vehicle information among various states facilities.

Congress also must play a role in ensuring that a nationwide standard for commercial vehicle applications of IVHS technologies is established. There are currently several AVI technologies under evaluation for commercial vehicle applications. One technology is being tested under the "HELP/Cresent" program. (HELP is an acronym for heavy vehicle electronic license plates.) HELP technology is used to expedite carrier registration in all 50 states and Canada. Cresent is the shape of the 14 states and Canadian province on the Interstate 5 and Interstate 10 corridor on which the IVHS technology is being tested. Test demonstration sites include:

- Anthony, New Mexico—Port of Entry on I-10 on the Texas/New Mexico border.
- Ashland, Oregon weigh station on I-5.
- St. George Port of Entry on I-15 at the Arizona/Utah border.
- Santa Nella, California weigh station on I-5.

The HELP pilot program uses a centralized database and on-board AVI transponders. Another technology is under evaluation in the "Advantage I-75" pilot program. The Advantage I-75 test spans six states along Interstate 75 and two Canadian provinces. Unlike the HEIV/CRESENT program, this pilot program uses a decentralized system. Although these two AVI systems perform the basic AVI function, their data capacity is limited and the systems are incompatible with one another. A vehicle equipped with a HELP transponder cannot communicate with an I-75 AVI reader and vice-versa.

If smart highways are to become the norm throughout the United States, a standard must be developed that will ensure that all AVI transponders are compatible with all transceivers throughout the U.S. Without nationwide transceiver/transponder compatibility, AVI systems become useless for commercial vehicle applications and far less valuable than need be for all other applications. For example, imagine a circumstance in which three neighboring states each invest in a different IVHS technology. A truck equipped with one technology travelling through these three states could only make use of the IVHS system in one state. As IVHS is developed for commercial and other applications, we must deploy systems that are compatible and able to communicate with each other.

Technical standards are being developed which could be the basis for a seamless, interoperable system. For example, the CALTAANS standard developed by the California Department of Transportation and Lawrence Livermore Laboratories has been incorporated in MFS Network Technologies' "Type 3" AVI system is gaining industry-wide acceptance. The CALTRANS standard requires the use of badge-shaped read/write tags carrying a 128-bit message and 256 bits of memory. This standard meets the functional requirements of commercial vehicle operations specified by the American Trucking Association. California has enacted legislation (subject to certain exceptions) mandating that only CALTRANS-compatible AVI transponders be used in California. The CALTRANS standard's emergence as an industry standard is evidenced by:

- the Federal Highway Administration's recent decision to evaluate the CALThANS Specification;

- the adoption of aspects of the CALTRANS standard by the Massachusetts Highway Department of Transportation in its Boston Artery Project; and
- several private and public toll projects evaluating the CALThANS standard in Canada and Mexico.

Congress should encourage adoption of the CALTRANS standard as a nationwide industry standard, while preserving sufficient flexibility for the development of other innovative IVHS technologies. In this regard, through its oversight authority, the Commerce Committee should encourage the Federal Communications Commission ("FCC") to adopt policies that will foster the development of and accommodate numerous AVI technologies.

FCC PROPOSAL TO ALLOCATE PERMANENT SPECTRUM FOR AUTOMATIC VEHICLE IDENTIFICATION SYSTEMS

The FCC has proposed to adopt a plan submitted by Pactel Teletrac to allocate the majority of the 26 MHz available in the 902-928 MHz AVI band to exclusive use of wideband pulse ranging technologies used by Pactel Teletrac and others. The FCC specifically plans to set aside two 8 MHz blocks of spectrum for the exclusive use of wideband pulsing systems manufactured by Pactel Teletrac and MobileVision. All other AVI technologies, including MFS Network Technologies' and Texas Instruments' AVI technology, will be forced to share the remaining 10 MHz of spectrum which would be divided into small slices of spectrum.

MFS Network Technologies, along with Texas Instruments, opposes the FCC's plan to allocate exclusively such a large segment of the spectrum allocated to AVI to just one (wideband pulse ranging) type of technology. As a matter of public policy, MFS Network Technologies believes that the Commission should not allocate spectrum in a way that would stifle the development of new and different technologies. It is important that all other AVI technologies are not crowded into 10 MHz of spectrum, while two companies (Pactel Teletrac and Ameritech) utilizing only one of several available technologies monopolize 16 MHz of the available 26 MHz of spectrum. This would limit the value of AVI systems thereby undermining many ongoing and planned projects for state governments as well as private industry. Some of these projects are designed to use more than 8 MHz of spectrum.

MFS Network Technologies and Texas Instruments have proposed that the Commission reduce the spectrum devoted exclusively to wideband systems by allocating one 8 MHz spectrum block and permitting other AVI technologies to share the remainder of the available contiguous 18 MHz of spectrum. This proposal will permit wideband systems to operate free from interference from narrowband systems while providing enough room for other innovative AVI technologies to operate and encourage a competitive market for IVHS to develop. As members of the Senate Commerce Committee, it will be important that you provide effective oversight for these and other issues that will affect the successful implementation of IVHS technologies.

CONCLUSION

I greatly appreciate the opportunity to share with you some of the possible applications of IVHS technology to solve the nation's transportation problems. Companies such as MFS Network Technologies stand ready to continue making the investment necessary to develop state-of-the-art technological solutions to today's transportation problems.

[Miscellaneous information, articles, and charts may be found in the committee's files.]

Senator EXON. Mr. Moersch, thank you very much. I have a few questions and then there will undoubtedly be some other questions which we will submit to you, and ask that you return your answers as promptly as possible because this is a very important hearing. This hearing is going to help us along the track, if you will, to assist in working with you and seeing that the Government is in a position of being helpful and not a hindrance.

Without objection, at this time, I would like to ask that an opening statement by Senator Hutchison be placed in the record at this time.

[The prepared statement of Senator Hutchison follows:]

PREPARED STATEMENT OF SENATOR HUTCHISON

Intelligent vehicle highway systems technology is an important part of the United States' strategy to increase competitiveness. Put simply, IVHS will permit us to increase productivity by eliminating transportation delays.

Traffic congestion is more than an aggravation, it is a major economic drain. The economic cost lies in excess fuel consumed, environmental damage from increased auto emissions and higher automobile insurance premiums paid by residents of large congested urban areas. Delay also has less calculable opportunity costs; afterall, "time is money." What is the cost of a missed deadline? Of a part that does not arrive in time? America's businesses know it is high.

In Texas, seven cities were studied by the Texas Department of Transportation and were estimated to have approximately \$3.5 billion associated with the adverse aspects of congestion, or \$330 per capita. Dallas and Houston have estimated congestion costs in excess of \$1 billion. That's \$1 billion wasted.

I find it especially fascinating that IVHS technology can potentially reduce one of the most substantial operating costs to many businesses, especially small businesses—regulatory compliance. This technology will permit a seamless transfer of fuel tax, vehicle registration, manifests and registration as motor carriers cross state lines. Imagine the savings in time, effort and energy this development will have.

However, there is another—more precious—cost frequently found in association with highway usage and congestion. That cost is often in human life. IVHS is an important means for achieving safer highways.

For example, implementation of IVHS technology means better ability to track the transport of dangerous chemicals and may result in having a more effective crisis management plan at the ready—just in case. It could mean having vehicles that sense and avert oncoming disaster on the highway. And it could mean having a city's police and the transportation system work in unaccustomed harmony at the onset of a natural disaster.

These are life and money¹ saving uses for IVHS technology and the government has a role in bringing them to fruition. Our job, however, is to determine how best to fulfill that role. How best can we help implement this technology within our present fiscal constraints and in a way that maximizes the invaluable contribution of private industry in funding, technology and "can-do" initiative? I look forward to learning more about the answers to such questions today.

Senator EXON. Let me ask this question first. As many of you may know, I have been a strong advocate of the civilian uses for the Global Positioning System commonly called GPS. Will GPS capability and technology be integrated into the IVHS systems which you are discussing and explaining here today?

In your opinion, should GPS be under the control of the Department of Defense or the civilian sector? Can civilian uses of GPS help recoup Federal investments in the system and defray future costs?

Would any or all of you care to answer those questions?

Dr. COSTANTINO. I can just comment very briefly. GPS is already used in IVHS vehicle location and navigation systems. It is used primarily as a backup to dead reckoning systems and other systems in the vehicles themselves, to verify positions of vehicles. I believe that in the long run GPS, which has become very popular and can be made more accurate with additional equipment, will eventually be used either as a primary means of location or certainly a backup means.

Senator EXON. Any other comments? Does everybody agree with that?

One other question then of the panel as a whole. Given that Congress will appropriate approximately \$200 million in fiscal year 1994 for IVHS, do you believe that the \$10 million allocated for a commercial vehicle program and especially the \$3.5 million originally suggested by the Senate for the Motor Carrier Safety Assist-

ance Program for IVHS deployment is adequate? Should the amount and distribution be increased or revised in future years?

Dr. COSTANTINO. The amount of money that has been appropriated is for research and development primarily, and demonstration. There is no money that has been appropriated for deployment of anything. So, eventually the Congress is going to have to address that particular issue. Otherwise, the States and the people out in communities will have terrible decisions to make as to whether they repair and maintain what they have now, or whether they are able to put money into new things. I believe that eventually we are going to have a full-blown IVHS system deployed, and any money that we put in it now can be offset by savings on the part of the users.

Mr. KOLSTAD. I might just comment, Mr. Chairman. I do not know that I am competent to speak about the amount of funds, but it seems to me that the management of the money is as important as the amount of it. And as I pointed out in my testimony, in this field of IVHS technology I think it is critically important that there be a mechanism to ensure that the management of these funds is done in such a way that this money can be much more easily contracted for.

Mr. MOERSCH. Senator Exon, we would like to add that, the exact amount is probably best not our assessment. However, what we would like to do is see the Federal Government and Congress move that money from funding continued pilot projects and technology development to creating standards and encouraging the vendor community to invest in technology. Let us bring the capability to the marketplace. And let us compete for the business and work with the public agencies to build the infrastructure.

Right now I think that some of the smaller companies are at a great disadvantage to some of the larger companies because it is a virtual "beauty contest" to attack and win these pilot programs, not a practical competition or implementation of anything useful on a long-term basis.

I am not saying that they have not been useful, but I think that the time is now, so—let's cut bait, let's spend the money to create the standards. The California or CALTRANS standard, as endorsed by Amtech, is the same standard that we have adopted and literally invested into. The FHWA is looking at it and we believe that it creates an opportunity for a level playing field and a real deployment of a real system. And we think that that would serve the country and our ailing infrastructure the best.

Mr. KOLSTAD. If I might make one additional comment, Mr. Chairman. Both Japan and our European neighbors are moving extremely aggressively in this area. And I personally believe that today the United States has somewhat of a lead on both of those continents. But there is no guarantee that that will continue, and it seems truly tragic to have IVHS technology go the way of the automobile. So, I would hope that we could maintain our superiority.

Mr. MORTENSON. Senator, I agree with Mr. Moersch. The real key going forward in deployment of a lot of IVHS technologies is going to be, as well as the standards issue, forging the regulatory at the environment, at the State and local level, that allows for

true public-private partnerships. I hear that phrase an awful lot, but I see it truly implemented not so many times.

In Dallas, for example, on the Tollway that we showed you with the electronic toll collection that Senator Hutchison likes a lot because she lives there and gets to use it daily, that was a case where we went to the Texas Turnpike Authority and said we will install this system free; no capital risk, no technical risk. And we offer that as a service to the public, almost as a concession model on a State—otherwise State-run and owned tollway.

We and our colleagues in industry would, I think, like to do that many many more times across the country, but every State and local agency that runs a toll facility, for example, has a bewildering array of statutory backdrops and even bond indenture provisions that sometimes are huge blockades toward deployment of systems like this, even when funded 100 percent by the private sector.

Senator EXON. Mr. Moersch, let me ask you this question. And if any of the others care to comment on it, I would certainly be interested in what you have to say.

In your testimony, you say that Congress must help ensure that a nationwide standard for commercial vehicle application of IVHS is established. How do you see Congress assisting in this area, given that technical standards setting is often the type of activity best left to agencies and other experts?

Mr. MOERSCH. I think a lot has to do with the process of funding. And to control the funding and move the funding into earmarked areas to develop standards; to set the challenge and charter for those relevant agencies to create the standards; to look for ways to influence, as Mr. Mortenson mentioned, these policies to the State and local level.

What we see today is a lot of discussion, a lot of movement, and not a lot of results. We talk about the CVO standards that are emerging in the United States today, yet we have two distinct totally separate technologies being implemented, one north to south and one east to west. I think it is a crime that we are spending taxpayers moneys and ending up with nothing in the end other than a "successful pilot" that will go the way of the dinosaur.

So, I do believe that Congress does play a role. I believe that Congress and the individual Congressmen and women need to help set and implement these policies both at the Federal and the State level.

Senator EXON. Mr. Mortenson.

Mr. MORTENSON. Senator Exon, I think another part of our message since we, as competitors, really agree on this, is why invent the wheel all over again. The State of California went through a very lengthy investigative process in setting their statewide standard. They conducted public hearings. They sought input from industry. They hired the Lawrence Livermore National Laboratory to do technical studies for them, as well as other technical consultants. And it was about a 3-year process that resulted in what we consider to be a viable standard.

California has led the Nation in many respects in driving various aspects of the commercial vehicle and automotive industry, and we would just suggest to the subcommittee and to the Federal Highway Administration, as we have and as they are examining, that

this is an appropriate place to start instead of starting all over again.

Dr. COSTANTINO. Mr. Chairman, IVHS America has a very active committee on standards and protocols, committees on systems architecture and so forth that have the full participation of the membership, which includes public and private and State, local, academic, and so forth. They participate fully with the standardmaking bodies in this country, and with the world standardmaking bodies.

The setting of standards is a very difficult process, and if you set standards and system architectures too soon you eliminate necessary research and development that should go on. If you set them too late, you get in a position, as was described by Mr. Mortenson, where you may have completed sets of equipment and then you wonder what you do with two that are not alike.

The Federal Government I think can help in the standardmaking area by not funding agencies that are not generally in the standardmaking business. But anybody can produce a standard. We have a group out in the Midwest you may be familiar with, called the Enterprise Organization, that is proposing standards for rural areas in various aspects of IVHS. Well, that is not so good because in other parts of the country they do not work well. And there may be standards which work wonderfully in Europe or maybe in Japan, but they do not have the support of a majority of the members of our organization.

But as I suggest, nothing has been decided at the present time, but standardmaking bodies are working and are trying to arrive in an orderly fashion at proper standards in IVHS.

Mr. MOERSCH. One last comment to follow up on the California/CALTRANS specification. Our neighbors to the north of us in Canada and to the south of us in Mexico and even South America are evaluating this standard that has been created in California. It would be a shame to export such a standard and not give the American public a chance to take advantage of.

Senator EXON. Gentlemen, thank you very much. There will be some additional questions for the record.

We really appreciate all of you as experts coming to give us your advice. I think you will all harken back to the opening statement which I made when we brought this matter up today in the committee because I do have some concerns about the fact that we may be going off on inventing everything without getting into the practical application. I believe that is what some of you are emphasizing here in your testimony today.

It has been very helpful and I thank you again for being here. I would hope that you could give us as prompt a reply as possible to the questions which we will have for completion of the record. With that, thank you very much, and you are excused.

We will call the second panel now, a panel of three. Mr. Harry Voccolla, senior vice president of the Lockheed Systems IMS Co.; Mr. John J. Collins, senior vice president for government affairs, American Trucking Association; and Mr. Paul R. Henry, manager of the Transportation Service and Federal Programs, Oregon Public Utility Commission representing the Commercial Vehicle Safety Alliance.

Thank you all very much for coming. We will start the presentation with Mr. Voccolla. I would advise you, Mr. Voccolla, as you probably heard, that your and the other members' testimony has already been accepted as a part of the record. I would appreciate it very much if you could summarize your statement at this time. Mr. Voccolla.

**STATEMENT OF HARRY VOCCOLA, SENIOR VICE PRESIDENT,
LOCKHEED IMS CO.**

Mr. VOCCOLA. Thank you, Mr. Chairman. I appreciate the opportunity to present this morning. In order to avoid the red light, I in fact do have a 4½-minute videotape which I think will summarize my testimony. Basically, what the video will show you is that the trucking industry spends about \$20 billion a year or more in taxes and registrations. State and industry spend about \$5 or \$6 billion to pay and collect that \$20 billion. This videotape I think will show you some of the solutions currently in place today in truly a private partnership with States and the trucking industry, and, effective today, no expense from the Federal Government.

[A videotape was shown.]

Mr. VOCCOLA. We believe that these preclearance functions that were identified here are worth tens of millions of dollars per year in savings to the industry and to Government, and will improve not only vehicle safety but also the industry's competitive advantage in the global marketplace by reducing the cost of shipping goods.

The tape you saw demonstrates the first successful continuously operating self-sustaining IVHS project in this country. We are convinced that IVHS is a multibillion dollar market and that CVO is an early benefactor of IVHS, thus leading the way in market development. Much of the market, we believe, is in areas yet to be defined where IVHS will spawn services and products that are not yet defined.

We feel strongly that public-private partnerships such as HELP and HELP, Inc., should be accelerated. We would encourage a market-driven approach to the deployment of IVHS. Thank you.

[The prepared statement of Mr. Voccolla follows:]

PREPARED STATEMENT OF HARRY W. VOCCOLA

Mr. Chairman and Members of the Subcommittee, my name is Harry Voccolla. I am Senior Vice President of Lockheed Information Management Services Company, a wholly owned subsidiary of the Lockheed Corporation. We are a founding member of IVHS AMERICA and serve on their Board of Directors. I thank you for the opportunity to present testimony that I hope will explain Lockheed's involvement in IVHS and Commercial Vehicle Operations. I have a brief videotape. But first would like to explain Lockheed's role in IVHS and in CVO.

The Lockheed Corporation has always been recognized as a leader in the integration and operation of complex Technologies within the aerospace and defense industries. Starting about 1986, Lockheed began to investigate Transportation as an area where the integration of certain technologies could make a positive difference in the way Commercial Vehicle Operations are conducted in this Country and on the North American Continent by both the Trucking Industry and by the governmental agencies overseeing the industry.

Our research uncovered a number of facts that led us to believe that the application of technologies could have a significant impact on the Motor Carrier Industry:

- It is estimated that it costs as much as a dollar a minute to operate a heavy vehicle on a highway.

- Paperwork processing and time delays for mandated inspections are among the major concerns of the industry.

- Oversight in the areas of revenue auditing and regulatory enforcement are a major cost for government.
- Uniformity in regulation and reporting could reduce industry and government costs.
- The Trucking industry contributes through a variety of fees or taxes tens of billions of dollars per year to help maintain the highway infrastructure.
- The expense to collect these fees cost industry between two and three billion dollars annually and government at least that much.
- Safety and clean air compliance are issues that are receiving focused attention, and are candidates for technology solutions.

In approaching this marketplace, Lockheed developed two relationships, both of which can be considered Public-Private Partnerships:

- The first was a partnership with the American Association of Motor Vehicle Administrators, or AAMVA, under which we funded and developed the Vehicle Information System for Tax Apportionment, or VISTA, to simplify the collection and processing of regulation, registration and taxation data for trucks travelling interstate. VISTA is a CVO database network operating in 35 state agencies today.
- The second relationship can be defined as the first Public-Private Partnership in IVHS. Under contract to a consortium of state agencies, various IVHS technologies and an automated networked system were utilized to expedite heavy vehicle movement along interstate highways.

The video describes that contract; very simply, instrumentation has been placed in the road as well as in the vehicles using the road. The applications in place today include the ability to weigh a vehicle at highway speeds and to verify certain credentials such as registration, fuel tax, insurance, HAZMAT, etc., and to collect data automatically for a truck's required state reporting as well as to provide management information for the trucking company. We are also working on checking vehicle exhaust emissions and certain safety components such as brakes, etc., as a vehicle is travelling the highway. We believe these preclearance functions are worth tens of millions of dollars in savings per year and would improve not only vehicle safety but also the industry's competitive advantage in the global marketplace by reducing the cost of shipping goods.

The federal and state funding of the Crescent Program has been discontinued and, since October 1st, a private not-for-profit corporation—HELP, Inc.—has been formed to continue to evolve and expand the functionality of the network with the expectation that additional value can be realized by the Trucking Industry and by State Governments. Lockheed under contract to HELP, Inc. has assumed the operational responsibility for the system and expects to be funded by user fees for products and services provided to users.

This is the first successful, continuously operating self-sustaining IVHS Project in this country. I feel that, in the CVO area, the United States is in the lead, but I am concerned that we must move in an accelerated, coordinated fashion to maintain that lead. Attention and encouragement should continue to be given to the HELP, Inc. Program to assure rapid deployment.

We are convinced that IVHS is a multi-billion dollar market and that CVO will be an early benefactor of IVHS, thus leading the way in the market development. Much of the market will be in areas where IVHS will spawn services and products that are not yet defined.

Thank you.

Senator EXON. Thank you, Mr. Voccolla. Mr. Collins.

STATEMENT OF JOHN J. COLLINS, SENIOR VICE PRESIDENT FOR GOVERNMENT AFFAIRS, AMERICAN TRUCKING ASSOCIATIONS, INC.

Mr. COLLINS. Thank you, Mr. Chairman.

My name is John Collins. I am senior vice president for government affairs with the American Trucking Associations. It is a pleasure for me to be here today to talk about IVHS technologies.

We do believe that IVHS technologies offer potential benefits for the trucking industry. But we think as the Government goes forward, we have to be guided by three fundamental principles.

The first is the principle of compatibility. The systems must be compatible. Second, as Administrator Slater said, the systems must be voluntary, to make sure that there is acceptance by users. And

third, and one that really has not been talked about too much today, but I will be talking about it, is to make sure that the systems are cost effective: to make sure that we are not gathering data just for the sake of gathering data. We need to ensure that the technologies that are required are really technologies that offer some benefits.

Going back to the principle of being compatible. I am the unhappy owner of a Sony Betamax. Nobody in the trucking industry wants to be left with a Betamax technology while everyone else has gone to another technology. That really crystallizes our concern.

The points you made, Mr. Chairman, about some of the vendors going to the appropriation committees for particular demonstration projects is part of the concern we have about compatibility. We are starting to see requirements for a proliferation of tags underneath the vehicle. That is not good for us. It is not good for the economy.

The second principle is voluntary. The trucking industry is incredibly diverse. What makes sense for a trucking company with 2,000 trucks does not make sense at all for a farmer from Nebraska who has to worry about one truck, and knows where that truck is. You have different degrees of technology that are needed for different kinds of problems.

The third principle is cost effective. And that is to make sure that we are not gathering data just for the sake of gathering data. We are worried that there might be a push toward unnecessary automation just because the technology is capable of doing it.

I would like to apply those three principles to six areas that FHWA is looking at right now. They are described in Administrator Slater's written testimony.

The first is preclearance. You have seen some pictures of preclearance. That means as a truck comes to a State border, the electronics are there to speed that truck along its way. We think that that is a tremendously important technology and one that offers a lot of advantages for trucking companies.

Our concern is that we do not get overly optimistic in describing what the benefits are. Mr. Chairman, if you have an empty flatbed truck, you know that that truck is not going to have a weight problem, the commercial inspectors along the side of the road are not going to spend any time weighing that truck.

So, somebody who counts every time that truck moves as a savings for a CVO technology is overestimating the value. Because, right now, smart inspectors wave trucks through that obviously comply with the weight restrictions. So, we have got to be careful that we do not get too much caught up in making mathematical projections that overemphasize the benefits.

The next area FHWA is looking at is roadside inspections. We think that there are tremendous advantages for increased technology at roadside inspections, to make sure that the data that is already in the computer systems out there from other inspections that have happened up the road are made available to the inspection officer. We think, however, it is very important to have the technology at the roadside; to make sure that the technology is there to inspect the vehicle and that additional equipment not be added on to the truck.

The third area is commercial vehicle administrative processes. Right now, if you drove in your car from Virginia to Maryland, you would not have to worry about any paperwork requirements. But trucks do. Trucks have to make sure that they paid registration fees and the proper amount of fuel tax and a whole series of administrative requirements.

The opportunity to take IVHS technology and to streamline that paperwork is incredibly important. The big problem right now is not demonstrating the technology, but it is what is called "institutional barriers." That means one State agency does not talk to another State agency.

An example of institutional barriers is that the bells and lights that apply in the Senate are not the same bells and lights that apply to the House. So, there is not a technological compatibility even this close together. Compatibility does not exist in the many State agencies as well.

The fourth area is onboard safety monitoring. These are devices in the truck that actually help alert when there are safety problems. A lot of these technologies are really unproven. We are very interested in them. One of the things we are extremely interested in is the notion of a device that might be able to detect how alert the driver is.

Right now, we have hours of service that are kind of rote. The same hours apply to every driver, whether he has a cold or whether his metabolism makes him very alert. The idea of an alertness technology might be something that would be very helpful.

Other issues—commercial fleet management, to let truckers know where their trucks are—that can be helpful in certain kinds of operations.

And, finally, hazardous incident notification, provided that this can be done in a cost-effective manner, offers some potential. What we are concerned about is that there is such a huge number of hazardous material shipments that move safely that we should not set up a technology to capture more data than is absolutely necessary.

Mr. Chairman, that concludes my statement. Our guiding three principles are to make sure IVHS systems are compatible, voluntary, and cost effective. I would be happy to answer any questions.

[The prepared statement of Mr. Collins follows:]

PREPARED STATEMENT OF JOHN COLLINS

INTRODUCTION

My name is John Collins. I am senior vice president of Government Affairs of the American Trucking Associations (ATA). We welcome this opportunity to testify before the Subcommittee concerning the views of the motor carrier industry on the Commercial Vehicle Operations (CVO) portion of Intelligent Vehicle Highway Systems (IVHS).

ATA is the national trade association of the trucking industry. Through its 51 affiliated state trucking associations, located in every state and the District of Columbia, ten affiliated national organizations, and over 4,000 individual motor carrier members, ATA represents over 30,000 motor carriers of every type and class in the country. Because of its membership and the degree to which IVHS technologies and projects will affect these businesses, ATA has a significant interest in the choice of IVHS projects to receive federal funding, and in the broader conceptual goals behind the federal IVHS program generally.

ROLE OF TRUCKING IN THE U.S. ECONOMY

At the outset, it may be useful to emphasize the scope and diversity of the trucking industry and the importance of the industry to the U.S. economy. Some 14.7 million commercial trucks are registered in this country, of which 1.6 million are combination-vehicles. There are in all some 245,000 motor carrier companies, of which the vast majority (88 percent) qualify as small businesses under Small Business Administration definitions.

Trucks carry 42 percent of the tonnage of freight moved by all transportation modes, and account for 18 percent of the nation's freight bill. Trucks serve every community in America, and 70 percent of communities are served only by truck.

More than 7.8 million persons are employed in jobs related to trucking, and these people are paid over \$225 million in wages annually.

Very clearly, technologies which benefit the trucking industry stand to have a beneficial effect on the nation's economy.

The trucking industry is as diverse as it is enormous. Trucks carry all conceivable kinds of freight, use many different kinds of equipment, and maintain extremely varied types of operation. There are private and for-hire carriers; carriers which specialize in large or in very small shipments; carriers which are local, regional, interregional, or national; carriers which use ordinary tractor-semitrailer combinations, and carriers which operate an extraordinary variety of specialized equipment to move loads where they need to go. It should be evident that any given technology may or may not be appropriate for or useful to any given segment of the trucking industry.

CURRENT TECHNOLOGICAL APPLICATIONS

Many elements of technologies included under the IVHS umbrella have already been successfully adopted by some elements of the industry. Among these may be counted: satellite tracking systems for vehicle location and dispatch, on-board computers to monitor vehicle operations, electronic engines, smart cards to regulate fueling, vehicle navigation and routing systems, and electronic data interchange.

Few if any of these technologies are appropriate for every type of motor carrier operation. They are being implemented where they make sense for specific companies. It is not hard to understand why this should be so. The largely deregulated U.S. trucking industry is highly entrepreneurial and intensely competitive; costly technological frills are rejected, but each carrier will seek out and employ whatever technology will enable it best to fill its chosen niche in the overall transportation market.

THE TRUCKING INDUSTRY'S IVHS GOALS

Our experience with current technologies leads us to support three goals for IVHS programs.

- First, whatever IVHS projects are sponsored by government, they should remain VOLUNTARY on the part of motor carriers. Where technology is effective, the market will ensure that it is adopted where it makes sense. Mandates are an inefficient means of dispersing technology and preclude innovation.

- Second, to receive federal funding, an IVHS project must demonstrate the potential to increase the efficiency and productivity of a significant part of the trucking industry—that is, the technological improvement must be COST-EFFECTIVE. In today's transportation marketplace where the profit earned by an individual truck averages less than \$2,000 per year, carriers cannot afford to adopt technologies which do not enhance the productivity and efficiency of their operations.

- Third, government must take care that the trucking industry not be confronted with technologies which are not COMPATIBLE with each other and with trucking operations for which they could otherwise be of benefit. ISTEA gave the industry relief from one set of duplicative state regulatory requirements—in the tax area—we do not want to trade the old array of fuel tax decals and reports for a set of mutually exclusive transponders and smart cards.

A great deal of money for IVHS research and development and for pilot projects to test these technologies was set aside in the Intermodal Surface Transportation Efficiency Act of 1991, and a wide range of IVHS projects has been proposed for federal funding. Not all of these projects are aimed at solutions that would be voluntary, cost-effective, and compatible with each other.

The trucking industry clearly has a great deal at stake in the development of IVHS technologies. We cannot be a passive observer as the process goes on. We are working to ensure that the industry's three aims for IVHS are fulfilled.

FHWA USER SERVICES PROJECT

In this context, let me comment on the current agenda of the Federal Highway Administration's CVO (Commercial Vehicle Operations) User Services Project. This, as we understand it, is a framework for IVHS projects and programs affecting trucks and trucking. We recognize that the User Services Project is a working draft, still being revised, but it will serve as an indication of FHWA interest and concentration in this segment of the federal IVHS development program.

The FHWA CVO Project is divided into six sections, which are as follows:

- Preclearance
- Automated Roadside Safety Inspections
- Commercial Vehicle Administrative Processes
- On-Board Safety Monitoring
- Commercial Fleet Management
- Hazmat Incident Notification

Preclearance

The first section, preclearance, is designed to allow a truck to pass state lines without stopping, just as a passenger car does, through the application of weigh-in-motion and automatic vehicle identification technologies. It is one of FHWA's top priorities.

There is indeed much here for some segments of the trucking industry, although these may turn out to be fairly small segments. For example, preclearance may benefit a long haul truck, but not a local delivery truck. The potential danger in this area comes from a too optimistic view, by government and equipment vendors, of the benefits for the industry at large and resulting government mandates for carriers to employ the new technology, whether or not it is actually cost-effective for transportation. The trucking industry and the states have spent much time, money, and effort in recent years to reduce inefficient truck regulation. We should not reburden trucking operations with inefficiencies in the name of technological "improvement."

Attention should be focused on the more essential elements of preclearance, those which are easily implemented or which are of demonstrated benefit to carriers. Among these may be cited the exploration of weigh-in-motion (WIM) technology for reducing traffic and delay at ports-of-entry and the use of vehicle identification to enable trucks to bypass ports altogether. Most especially, attention should be devoted to the removal of the so-called institutional barriers to industry productivity, administrative and regulatory practices at all levels of government which are needlessly burdensome to transportation efficiency and regulatory efficiency as well.

Automated Roadside Safety Inspections

The area of automated roadside safety inspections shows promise of greater efficiency in Motor Carrier Safety Assistance Program (MCSAP) vehicle inspections. MCSAP is a program the trucking industry has supported for many years and which has proven its effectiveness in promoting highway safety. As we understand it, automated roadside inspections would involve a truck being pulled over to the roadside and the inspector using a variety of sophisticated electronic diagnostic gear to determine possible malfunction or misadjustment of vehicle systems such as brakes, drivetrain, and electronic systems. ATA believes such a procedure could well speed vehicle inspections and enable inspectors to focus on the vehicle populations that need it. However, we believe that the electronic equipment should be at the roadside and that carriers should not be required to install new on-board equipment.

Commercial Vehicle Administrative Processes

Commercial vehicle administrative processes include programs for carriers to purchase electronically state operating credentials and to obtain preclearance at international borders. These two programs could and should be priorities, although many institutional barriers remain. Carriers, even the largest, must ordinarily purchase their vehicle credentials by means of paper applications, because governments are unable to process electronic applications. The efficiencies to be gained by the application of already proven technologies in this area of government service could be very substantial, at what is likely to be reasonable cost. The same could be true of the technological enhancements that might be applied to international border crossings.

ATA supports further investigation in these two areas. Both of these have an affinity with the concept of preclearance discussed earlier. On the other hand, programs and technologies which endanger proprietary carrier information in the name

of tax administrative efficiencies will never gain widespread industry support or adoption.

On-board Safety Monitoring

FHWA seems to regard on-board safety monitoring as an area for which the technology is as yet unproven and, in the main, undeveloped. Provided that the results of research in this area are not mandated for motor carriers, this may prove a fruitful direction for further investigation. Safe operations are essential for long-term profitable operations. Therefore, a motor carrier has a great incentive to adopt a technological advance which, for example, might enable it to monitor vehicle performance at a distance.

Commercial Fleet Management

Commercial fleet management includes a variety of traffic management and navigation programs. The industry has been closely involved in the testing of these ideas. As an example, we worked with the TRANSCOM pilot in the New York City area, in which government traffic information was organized according to a carrier participant's needs and furnished daily, hourly, or real-time. This technology area could readily achieve results which might be of the greatest importance to some kinds of trucking operations. The ATA Foundation is closely involved in several additional projects of this type.

Hazmat Incident Notification

Hazmat incident-notification aims at the provision, especially to local governments, of information on incidents involving hazardous materials. In addition to data on the nature of the material involved and severity of the incident, the information provided might include geographic data on assistance and evacuation routes, weather reports, and the like. Provided such information can be provided in a cost-effective manner, this area, too, is well worth investigating. ATA cautions, however, that owing to the enormous volume of hazardous materials that we transport for shippers, the costs associated with broadly mandated IVHS technologies in this area could easily be overwhelming and are unnecessary given the fact that the vast bulk of hazardous materials shipments are delivered without incident.

CONCLUSION

In conclusion, ATA believes IVHS technologies hold much that is of potential benefit to the trucking industry. We will continue to work hard to set the IVHS standards that will result in programs and technologies that are 1) voluntary, 2) costeffective, and 3) compatible.

Thank you for the opportunity to comment. I would be happy to answer any questions.

Senator EXON. Thank you.

I will move to Mr. Henry before I ask you any questions. But you jarred my memory. I am a proud owner of two Betamax machines. [Laughter.]

While Mr. Henry is giving his explanation, would you please tell me when Betamax will return? [Laughter.]

Mr. Henry.

STATEMENT OF PAUL R. HENRY, PAST PRESIDENT, COMMERCIAL VEHICLE SAFETY ALLIANCE

Mr. HENRY Thank you, and good afternoon, Mr. Chairman.

My name is Paul Henry. I have served on two separate occasions as president of the Commercial Vehicles Safety Alliance, and am currently their chairman of the size, weight, traffic enforcement and intelligent vehicle highway system committee.

CVSA is an association of State, provincial, and Federal officials responsible for the administration and enforcement of motor carrier safety laws throughout the United States, Canada, and Mexico. Additionally, our membership includes over 200 industry members who are committed to helping the Alliance achieve its goals.

We welcome the opportunity to discuss with the committee commercial vehicles and the national IVHS program.

CVSA supports the concept of intelligent vehicle highway systems. And we took particular pleasure in Mr. Chairman's opening comment regarding a focus on highway safety. With regard to IVHS user services, which interface directly with commercial vehicle operation, strong support can be expected from our Alliance, provided safeguards are in place to assure highway safety is not compromised.

The Alliance is working with the Federal Highway Administration on numerous fronts. And I will share with you quickly four of them.

One is called the Commercial Vehicle Information System. The thrust of this project is to identify problem carriers during the vehicle registration process, and require corrective action before authorizing vehicle renewal registration. In so doing, we will be treating the problem on the front end, rather than continuing to track and trace the problem utilizing today's inspection and audit resources.

A second item is referred to as the Premier Carrier Program. Generally, this program is seeking to establish an enhanced safety criteria or standard which will allow a carrier who meets that upper-end standard uninterrupted travel from point of origin to destination.

On the mechanical side, FHWA, my State, and a private engineering firm are engaged in a research project that employs a computer system, integrated into infrared heat sensors located on both sides of a truck weigh scale or an access road. The benefits of this research are less time under trucks by the enforcement community, accurate identification of trucks with brake problems, and less down time by industry incurred as a result of today's inspection process.

CVSA's staff, in response to the demand for increased activity in the field of IVHS and in partnership with FHWA, has recently established two new positions dedicated solely to IVHS work. The primary responsibility of these positions will be to establish a much higher degree of liaison with FHWA, the Alliance's IVHS committee, the States' enforcement personnel, the trucking industry, and the research community.

The Alliance believes the following six issues are critical to the success of the IVHS commercial vehicle program:

One, we strongly urge the designation of a State IVHS/CVO representative who is directly responsible to their governor, is the principal contact person for IVHS, and is the primary mediator to coordinate internal State issue.

Two, the time to educate enforcement personnel on IVHS/CVO movement is now. If this is not done, we believe there exists a strong risk that the enforcement community will not accept the program's concept. Electronic clearance will work only with the support of the enforcement community. To move forward without this group, we believe, may frustrate and slow the electronics clearance program by compromising it at the enforcement level.

Three, establish a public domain standard for the manufacture of transponder and interrogator equipment used to identify and

track commercial vehicles. And we have heard, Mr. Chairman, from numerous previous representatives how important that is.

Four, establish formats for computer-to-computer interfaces to be used for electronic vehicle credential verification.

Five, establish formats for motor carrier vehicle and driver inquiries.

And, six, in order for IVHS to be as effective as we think it can, we must have the cooperation and participation of all elements of government for regulation and enforcement, as well as our industry. To garner this support, we need to answer their questions that are being asked today. And in order to be responsive to these questions, we believe it is essential that a cost-benefit analysis be made and made as quickly as we can.

Regarding the issue of highway safety and MCSAP effectiveness. We believe that with the implementation of IVHS technology, as it applies to commercial vehicle operations, significant improvements will be gained in highway safety. Also, an increase in the effectiveness and efficiency of roadside safety inspections and other traffic-related enforcement duties performed by MCSAP personnel will be obtained.

In summary, sir, ISTEA calls for technology to be used to meet certain objectives: improved operational efficiency, reduced regulatory burdens, improved commercial productivity, and improved highway safety. The technology certainly exists today—we have heard that already—to attack these objectives. We believe IVHS corridor programs should be used to develop, implement, and start reaping the benefits of these technologies today.

We can continue to test and study new technologies from now until eternity and never really catch the perfect system. We are committed to an aggressive implementation of an international system that addresses the business issues identified in the cost-benefit analysis we have recommended above.

In conclusion, we applaud the work of the committee and look forward to continuing our discussions with Mr. Chairman and his committee.

Thank you very much for the opportunity, sir.

[The prepared statement of Mr. Henry follows:]

PREPARED STATEMENT OF PAUL HENRY

Mr. Chairman, Committee Members and Committee Staff, my name is Paul Henry, have served on two separate occasions as President of the Commercial Vehicle Safety Alliance ("CVSA" or "Alliance"), and am currently the Chairman of the Size, Weight, Traffic Enforcement and Intelligent Vehicle Highway System (IVHS) Committee. I am employed by the Oregon Public Utility Commission as the manager of Safety Services and Federal Industry Programs.

CVSA is an association of state, provincial, and federal officials responsible for the administration and enforcement of motor carrier safety laws in the United States, Canada and Mexico. The Alliance is a not-for-profit organization, established to promote uniformity in motor carrier safety inspection and enforcement. CVSA welcomes this opportunity to discuss with the Committee, Commercial Vehicles and the National Intelligent Vehicle Highway Systems (IVHS) Program.

CVSA member jurisdictions are responsible for administering and implementing interstate and intrastate motor carrier safety and hazardous materials regulations. Membership in CVSA is voluntary and includes all U.S. States except South Dakota, U.S. Territories, all Canadian provinces and territories, and the Country of Mexico. Jurisdictions are represented by various Departments of Transportation, Public Utility and Service Commissions, State Police, Highway Patrols, and Ministries of Transport. The major activities of Alliance members are based upon four

central themes: Inspection, Uniformity, Reciprocity and Compatibility. CVSA also includes over 200 associate members who are committed to helping the Alliance achieve its goals. These associate members include various federal agencies, truck and bus companies, industry associations, insurance companies, manufacturers, research organizations, commercial vehicle drivers, and individuals dedicated to highway safety.

CVSA was founded in 1980 and has been an international organization since its origin. The major accomplishments of the Alliance are:

- the unification of commercial vehicle safety in North America by including Mexico and Canada in the program;
- the development of various levels of inspection, including the North American Standard inspection for commercial motor vehicles;
- the development of uniform out-of-service criteria for drivers, vehicles and hazardous materials;
- the development of a uniform training curriculum for federal, state and provincial vehicle inspectors;
- the development of uniform sanctions and fine schedules;
- the development and implementation of a decal program for inspection reciprocity between jurisdictions;
- the development and implementation of a uniform international definition and identification of safe havens;
- the development of procedures for out-of-service and other defect repair verification;
- the development of inspection procedures for vehicles transporting spent fuel, high level radioactive and transuranic waste;
- the development of uniform cargo tank inspection procedures;
- the development of uniform bus inspection procedures;
- the Spanish translation of the North American Standard training program; and,
- recently CVSA expanded its headquarters staff to include two full time positions dedicated to CVO/IVHS.

The special committees of the CVSA include: Vehicle, Driver, Hazardous Materials, Bus, Regulatory and Legal Affairs, Data, International Affairs, Industry Advisory, Training, and Size, Weight, Traffic Enforcement and IVHS. It is through our committee structure that we are able to develop and implement both policy and product to support the goals and objectives of the Alliance.

GENERAL COMMENTS FROM THE ALLIANCE

The CVSA supports the concept of Intelligent Vehicle Highway Systems (IVHS). With regard to IVHS user services which interface directly with Commercial Vehicle Operations (CVO), strong support can be expected from the Alliance, provided safeguards are in place to assure highway safety is not compromised. The CVSA is committed to the proposition that a North American IVHS/CVO system can significantly improve highway safety and commercial vehicle efficiency, while at the same time serving to increase the efficiency and effectiveness of commercial vehicle enforcement work.

SPECIFIC COMMENTS FROM THE ALLIANCE

The four primary issue areas in which this committee requested comments are:

1. Current status of implementation by the Federal Highway Administration of the National IVHS Program, with particular attention to the Commercial Vehicle Operation (CVO) component.
2. Appropriate policy goals for the CVO component, which includes steps necessary to assure the broadest possible participation of both states and the private sector.
3. Discussion of the potential for IVHS technology to improve highway safety, and how the IVHS-CVO component can promote most expeditiously the effectiveness of the Motor Carrier Safety Assistance Program (MCSAP).
4. Assess U.S. owned technologies and processes which can be utilized in the research, testing, development and commercialization of IVHS-CVO systems.

Issue Number 1: Mr. Chairman, with regard to issue number one, the Alliance recognizes the business of IVHS is in its early design and developmental stages. We are also appreciative that IVHS technology is the vehicle that will manage North America's transportation system and safeguard the infrastructure in the future. CVSA is working closely with the FHWA on numerous fronts. Four very important activities currently underway include:

THE COMMERCIAL VEHICLE INFORMATION SYSTEM (CVIS).

Federal, state and private sector parties are working very hard to design a system that captures and utilizes all of the information resident in numerous data bases on motor carriers and their vehicles. In its simplest form, the CVIS concept seeks to place at the "finger tips" of commercial vehicle registration personnel across the country, critical information that allows the vehicle registration transaction to take place, or disapproval of the registration application based on the identification of a problem. If a problem precludes registration, the system identifies exactly what the problem is and what carrier action is required to secure vehicle registration. By example, this may include an unsatisfactory rating of a motor carrier, a vehicle inspection history that documents a high frequency of out-of-service violations, or an accident history that is unacceptably high. The thrust of this IVHS related work is to identify a problem carrier during the vehicle registration process and require corrective action before authorizing new vehicle registrations and in so doing, treat the problem on the front end rather than continuing to track and trace the problem utilizing inspection and audit resources.

PREMIER CARRIER PROGRAM (PCP).

This work is being addressed by a partnership of the principal parties of interest, federal, state and private sector personnel, including Canada, working together under the Alliance's IVHS Committee. Though early in the development process, the PCP concept represents one of the CVO safety elements under study in the field of IVHS.

Generally, PCP is seeking to establish an enhanced safety criteria or standard which will allow a carrier who meets the standard, uninterrupted travel from point of origin to destination. Currently we have three safety ratings; "Unsatisfactory", "Conditional", and "Satisfactory". Some of us are now looking at the Premier Carrier qualifications as a fourth class of rating which would identify the truly "premier" operator. When in place, the benefits are divided equally between the industry and the enforcement and regulatory communities. On the one hand industry saves time at weigh stations, time at inspection sites and time for vehicle credential checks. On the other hand the enforcement community will no longer spend its time inspecting vehicles that are routinely compliant, thus allowing more time to focus resources on vehicles and carriers who need regulatory attention.

INFRARED BRAKE TECHNOLOGY

Historically over one-half of the mechanical violations detected by inspectors are in the brake system. Fifty percent of these are brake adjustment. To detect most of the critical problems inspectors must do an undercarriage examination. This part of the inspection process takes approximately one half of the total inspection time. FHWA, Oregon and a private engineering firm are engaged in a research project that employs a computer system integrated into heat sensors located at both sides of the truck weight scale and inspection access roads. The concept is simple. Each brake on a truck emits a known temperature. Hot brakes, because of excessive use or too tight of adjustment, emit a higher than average temperature reading as measured by the infrared heat sensors; conversely, an inoperative brake will read a cold temperature. The benefits of this research are obvious: less time under trucks, accurate identification of trucks with brake problems and less down time by industry incurred as a result of today's inspection process.

CVSA STAFF.

In response to the demand for increased activity in the IVHS and related fields of research, CVSA in partnership with FHWA has recently established two new positions dedicated to IVHS work. The primary responsibility of these two positions will be to establish a much higher degree of liaison with FHWA, the Alliance's IVHS committee, the states' enforcement personnel, the trucking industry and the research community.

In summary, CVSA is working closely with FHWA and the truck and bus industry on many IVHS related projects. Each project takes time, is fraught with the challenge of new technology and in many instances institutional barriers. Individually, each project is important. Collectively, they will establish much of the foundation for tomorrow's IVHS.

Issue Number 2: With regard to Issue Number Two, I would like to share the Alliance's thoughts on several appropriate policy goals for the CVO component of IVHS.

PRE-CLEARANCE.

Deployment of vehicle pre-clearance technology calls for a possible phased approach to begin in 1997. This phased approach must be carefully planned to ensure that proper direction, guidance and appropriate financial support are provided. The Alliance believes the following issues are critical to the success of pre-clearing commercial vehicles at fixed or other concentrated enforcement sites (rest areas, etc.):

(1) The standards established for transponder and roadside readers must include the capability of sending and receiving messages accurately and quickly, and be compatible with other IVHS systems.

(2) Pre-clearance, whether during the initial phase or later phases, must be predicated principally upon motor carrier, vehicle, driver and other trip specific information.

Two-way transponders with on-board message capability are necessary to assist in protecting the integrity of the enforcement efforts conducted at fixed sites or other concentrated roadside efforts. Vehicles which are not pre-cleared or are not participating in the program will be required to pass through the inspection site. An on-board message retrieval system will assist in minimizing vehicles that have not been precleared, from by-passing the inspection site. Although there may be some merit to electronic message board usage in low traffic volume areas, in heavy traffic areas the signs can be distracting and cause confusion. The compatibility of readers and transponders becomes critical to the focus of an international IVHS/CVO program. To achieve a system of international pre-clearance, it is critical that the following be established:

(1) A public domain standard for transponder and interrogator equipment used to identify and track commercial vehicles;

(2) Formats for computer-to-computer interface to be used for electronic credentials verification; and,

(3) Formats for motor carrier, vehicle and driver inquiries.

Because the term pre-clearance infers an inherent prejudgment of the motor carrier, vehicle and driver condition, the Alliance believes a more appropriate term would be "electronic clearance". Electronic clearance would be based upon real-time knowledge of motor carrier, vehicle, driver and trip information. Electronically clearing a vehicle is then dependent upon the interaction between enforcement strategies and computer logic decisions. The Alliance agrees with the principles that motor carrier, vehicle, operator and trip specific information will drive the electronic clearance concept. CVSA believes because of its unique composition, we can provide the best forum for identifying the safety elements necessary for electronic clearance.

IVHS GOVERNOR REPRESENTATIVE

CVSA recommends that each state designate a Governor IVHS/CVO representative to resolve state institutional concerns. It has been recognized from the beginning that many institutional barriers such as existing laws, agency policies and individual philosophies would surface as states working through multi-state consortiums, attempt to achieve "seamless" borders for CVO's. Only after exhaustive intellectual discussions, debates, and negotiation do these issues get resolved. With the multitude of individual agencies within states that interface with IVHS/CVO, these same institutional barriers exist at state level. Even though each agency involved with IVHS/CVO may designate a primary representative within a state, there is no single identifiable source other than the agency receiving the IVHS funding. While in some states this may be the CVO enforcement agency, in many instances this is not the case. It has been our experience that not in all instances are the desires and concerns of non-CVO agencies compatible with those of CVO responsible agencies. Therefore, this Alliance strongly urges the designation of a state IVHS/CVO representative who is directly responsible to the Governor, is the principal contact person for IVHS, and is the primary mediator to coordinate internal state issues. We believe this is a critical step to ensure the success of IVHS/CVO projects.

EDUCATION-ENFORCEMENT COMMUNITY

Steps must be taken now to assure the education of the enforcement community on the direction of IVHS/CVO, especially regarding pre-clearance and automated inspections. State authorities have expressed concerns relative to IVHS's ability to install a seamless transportation system. These concerns include: What about the way we have always weighed trucks and established size compliance? What do electronic credentials mean to me? How will driver, hours of service, drug and alcohol concerns be satisfied?

The enforcement community administrators, as well as first-line personnel, must be involved to ensure a positive IVHS posture. Electronically furnishing critical vehicle, driver and trip information at mainline speeds to the commercial vehicle enforcement community adds a new dimension to the enforcement business. Electronic clearance dramatically impacts existing methods and strategies employed by these enforcement agencies. This impact should be viewed as positive and bring about increased efficiency and effectiveness for the enforcement of motor carrier laws, rules and regulations. However, to reach this point, emphasis must be placed on educating and marketing IVHS within the enforcement community. We believe CVSA possesses the unique ability to provide the educational network to accomplish this task.

To move the electronic clearance concept to reality requires the active involvement of the enforcement community which will be effected by this technology. There are currently over 7,000 officers in North America trained in commercial vehicle safety enforcement. The time to educate enforcement personnel on the IVHS/CVO movement is now. If this is not done, there is a strong risk that the enforcement community will not accept the program concept. Electronic clearance will work only with the support of the enforcement community. To move forward without this group, will frustrate and slow the electronic clearance program by compromising it at the enforcement level.

PRIVATE SECTOR

CVSA's IVHS Committee, like all Alliance Committees is comprised of representatives from the states, Canada, Mexico, FHWA, and the industry. As a result of our dialogue on IVHS technology one item is clear, we need to develop a credible cost and benefit analysis. For-hire trucking companies that compete head to head on a daily basis are saying: What is in it for me? How will IVHS save me money? How will IVHS make me more competitive? How will IVHS technology change my relationship with the enforcement and regulatory communities? Proprietary carriers are asking the same kind of questions. Additionally, they are asking: How can IVHS assist my customers tracking-in-transit time and addressing real time inventory concerns?

What is the effect on environmental issues, infrastructures, state and national economies? What is the cost to equip vehicles with transponders and Who pays?

The same is true for roadside interrogators and Weigh-In-Motion (WIM) equipment. There is no question in the minds of us who work with IVHS that it holds the potential to create tremendous savings for all parties of interest. Over what timeframe and how much savings we don't know. One thing is certain—In order for IVHS to be as effective as we think it can be, we must have the cooperation and participation of all elements of government responsible for regulation and enforcement as well as the motor carrier industry. To garner this support, we need to answer the questions that are being asked today. In order to be responsive to these questions, it is essential that a cost benefit analysis be made now.

Issue Number 3: Regarding the issue of highway safety and MCSAP effectiveness, the Alliance believes that with the implementation of IVHS technology as it applies to CVO, significant improvements will be gained in highway safety. Also, an increase in the effectiveness and efficiency of roadside safety inspections and other traffic related enforcement performed by MCSAP personnel will be obtained.

Safety inspections will be predicated on selective probability and probable cause stops, as opposed to random selection. Vehicles will be inspected based on known information (carrier and vehicle history), identifying vehicles warranting an inspection or reinspection. Automated inspection technology will: decrease the time involved with the inspection process; enhance the efficiency and effectiveness of the roadside inspection program; free enforcement personnel to devote time and resources to other types of safety enforcement activities such as audits, traffic enforcement, accident investigations, and improve the productivity of the motor carrier industry.

Another commercial vehicle enforcement mandate to be served by the IVHS/CVO concept, is driver and vehicle out-of-service and defect repair verification. Congress has identified this specific area as a weak point in MCSAP. The Alliance has procedures in place for curbing the practice of leaving an inspection site prior to repairing defects deemed hazardous, or drivers departing while still in an out-of-service condition. The on-line driver and vehicle information system proposed in the IVHS/CVO plan would complement this on-going effort. The Alliance has no doubt that the combination of the existing effort and IVHS/CVO technology, will further reduce the number of drivers leaving an inspection site without repairing unsafe conditions.

Mainline screening of vehicles through high speed WIM technology will improve the effectiveness of weight and other dimensional enforcement efforts. Also, main-

line WIM screening coupled with computer logic decisions, will enhance the capabilities of detecting overweight vehicles and lead to improved pavement management.

In order to achieve these milestones, education for the enforcement community as previously referenced, is critical. This educational endeavor will require the commitment of financial resources. Because of today's costs associated with the management and conduct of each state's commercial vehicle/driver safety program, the Alliance does not support the diversion of MCSAP funds to fulfill this training need. Existing IVHS funds are the logical source to be designated for the completion of this information and training requirement.

Issue Number 4: With regard to an assessment of available and prospective U.S. owned technologies and processes to be utilized for research, testing, developing and marketing the IVHS systems, the Alliance is not currently familiar with each of the technologies. It is for this reason, that the Alliance has just added two new positions to its headquarters staff, whose responsibilities will be to focus on identifying current and future IVHS technologies.

CONCLUSION

ISTEA calls for technology to be used to meet certain objectives: improved operational efficiency; reduced regulatory burden; improved commercial productivity; improved safety. The technology certainly exists today to attack these objectives. We believe IVHS corridor programs should be used to develop, implement and start reaping the benefits of these technologies today. We can continue to develop, test and study "new" technologies from now until eternity and never catch the "perfect" system. The Alliance is committed to an aggressive implementation of an international system that addresses the business issues identified in the cost benefit analysis as discussed above.

In conclusion, CVSA applauds the work of this Committee, and welcomes the opportunity to continue its discussion concerning our nation's IVHS/CVO Program. On behalf of the Alliance, I thank the Committee for the opportunity to appear here today and express the views of our member jurisdictions.

Senator EXON. Gentlemen, thank you very much. Excellent testimony. I will have two or three questions, and then I will hold open the possibility that there may be other questions for the record from the subcommittee. I ask you to respond, as I have others testifying, as quickly as possible so we may close the record.

Let me ask this question of each of you. When the first of you responds, if the others agree with him, then we will not have to repeat the question. But in testimony submitted for the record, the National Private Truck Council suggested that the Federal IVHS program "should avoid activities in areas where the competitive business environment has already moved, such as 'fleet management' technology, including satellite tracking and mobile communications."

What are your responses to these views? Are you concerned that these private initiatives will be incompatible with the Federal IVHS investment?

Mr. COLLINS. Mr. Chairman, I will respond to it first.

There is a need for the Federal Government to get involved in the standard setting.

Senator EXON. Back to our experiences with our VCR's; right?

Mr. COLLINS. Exactly. We need to make sure that the tape from one machine will play in another machine. And when you go to the store, the tape you get will play in the machine you have at home. That is exactly what our concern is here.

If the Federal Government establishes standards to allow the machines to talk to one another, then other technologies, private technologies, fleet management technologies, can plug into that. They can continue to be stand-alone, if that makes sense to the in-

dividual company, but a lot of the advantages happen when the systems start talking to one another.

Senator EXON. Mr. Henry or Mr. Voccolla?

Mr. HENRY I would agree and support what Mr. Collins has said, Mr. Chairman.

Additionally, from our perspective, it is laudable what the industry has done to date. If a particular company or segment of the industry wishes to incorporate a unique technology, that certainly is not going to offend us. However, as vehicles move between our Nation, Mexico, and Canada, from the on-highway enforcement officer's perspective and, indeed, in order to capitalize and maximize on what we think IVHS should be all about, we need an international standard not just for the enforcement community, but to enhance the international productivity of the operating industry.

Mr. VOCCOLA. Mr. Chairman, I agree. Standards are essential, if we are going to realize the efficiencies of a nationwide system, and to develop additional applications to fit on to that network.

Senator EXON. Well, then, I guess after listening to your answers, what the National Private Truck Council says is that should avoid activities in areas where the competitive business environment has already moved. And you are saying, is all well and good, but the Government has a responsibility too. Even though most of you in private industry do not want the Government involved in anything, you are sending a clear signal to us that, notwithstanding the objections of the National Private Truck Council—which I understand supports IVHS generally—notwithstanding the good offices and efforts by some to move ahead in this area, and notwithstanding that others have already made investments in this area, we cannot and should not shy away from beginning to set some guidelines for a universal technology. Is that a fair summation of what you are telling me?

Mr. HENRY Yes, it is, sir.

Mr. VOCCOLA. Yes.

Mr. COLLINS. Mr. Chairman, picking up on that point, the Government has a natural role here. The Government is putting hundreds of millions of dollars into the technologies. It does not make much sense to buy one piece of equipment for one State that is not compatible with a piece of equipment in another State. That is not a smart purchasing system. That is the source of the Government's responsibility.

Senator EXON. Maybe you and I could get together and work out something to work our Betamaxes into this. [Laughter.]

Mr. COLLINS. Mr. Chairman, I was thinking of passing my tapes back and forth to you. I cannot send my tapes to anybody in my family, because they have a different technology.

Senator EXON. Mr. Voccolla, as you pointed out I guess in your testimony, IVHS can be an integral part of our efforts to provide for defense conversion. We hear talk a lot about that, and many of us are very much concerned about it. What is your view of DOT's efforts in this area? What suggestions do you have for ways to encourage this process further?

Mr. VOCCOLA. Well, we do see DOT getting into the ARPA funding arena now to help encourage and accelerate the defense industry's movement into the IVHS arena. Our opinion is that not just

technologies, but integration and operations of some of these very complex technologies systems and networks ought to be viewed as an area where aerospace and the defense industry can contribute. It is not just a matter of are there technologies that can be converted, but are there capabilities for the integration and operation of these technologies in the transportation infrastructure, where I think the defense conversion area should focus more?

Senator EXON. Mr. Henry, the American Trucking Associations has testified that the IVHS program should be voluntary for the trucking industry. What is your view about this issue, given that some have argued that the most significant safety benefits of IVHS could result through widespread or mandatory deployment?

There is obviously a difference of opinion here.

Mr. HENRY Indeed, there is.

I would respond to your question, Mr. Chairman, that on the front end, whether I be a member of the American Trucking Associations or one of the other associations or an independent operator, what we are hearing in the Alliance at the committee level is that regardless of the size of my organization, in order for me to make a decision as to whether or whether or not I wish to equip my vehicles with transponders and I wish to participate in IVHS/CVO technology, I need to be shown and understand what the cost and the benefit is.

Our associate members include a number of independent contractors, through a number of associations, including the American Trucking Associations. From the industry perspective, what we are hearing as a regulatory body is precisely that—in order for me to make a sound business decision, whether I run 1 or 10,000 trucks, I need to understand what the costs are and what the benefit is.

From the State and provincial enforcement perspective, I think that the implementation of IVHS makes all the sense in the world simply because I do not see our enforcement resources growing appreciably in today's marketplace. And we see IVHS's safety work as being important tomorrow and in the future to helping us select and target what vehicles we need to inspect, what drivers we need to inspect and what carriers we need to audit, sir.

Senator EXON. Well, it seems to me, we are talking about revolutions through technology, through improved safety, through improved productivity and so forth. Since safety is such an important part in the trucking industry, and if we could improve safety as much as I think we can with these systems in the long run, the more we standardize and make it easier for everyone to know what the process is, and if everybody plays by the same rules, I would think a main beneficiary of this would be the trucking industry itself from the bottom-line standpoint.

And I will continue to talk with all of the interested parties, and hopefully we can get everybody on board.

Gentlemen, I really appreciate your being here. As I said to the other panel members, we continue to work very hard on this matter. All of you coming here today have been an important part in helping us move along with what we should do or maybe should not do in the form of legislation.

Keep in touch. You all are always welcome here, and thank you for being with us.

With that, we are adjourned.

[Whereupon, at 12:30 p.m., the hearing was adjourned.]

APPENDIX

PREPARED STATEMENT OF SENATOR PRESSLER

I want to thank my colleague from Nebraska, Senator Exon, for chairing today's hearing on Intelligent Vehicle-Highway Systems (IVHS) for Commercial Vehicles. Although I no longer serve on this Subcommittee, I consider this issue to be of extreme importance to our nation's transportation infrastructure, and appreciate the Chairman's consideration for holding this hearing. By using advanced computers, electronics and telecommunications technologies, IVHS promises to make our surface transportation system less congested, more efficient, and, most important, safer.

Nonetheless, the cost of IVHS is expected to be substantial. This fact alone deserves considerable attention. We must ensure fiscal responsibility does not fall by the way side in our efforts to spur the technological advancement of our transportation system.

I look forward to hearing from our witnesses about IVHS implementation to date, and exploring the best course for its future.

PREPARED STATEMENT OF GENE BERGOFFEN, EXECUTIVE VICE PRESIDENT, NATIONAL PRIVATE TRUCK COUNCIL

I am Gene Bergoffen, Executive Vice President of the National Private Truck Council (NPTC). On behalf of the private trucking community, we appreciate the emphasis you are giving to commercial vehicle operations and IVHS activity, and the privilege of presenting our views today.

NPTC is the national organization exclusively representing companies who are not in trucking as a business in itself, but who operate truck fleets that support their main business activity, including manufacturing, processing, distribution, warehousing, retail and services. Our fleets range in size from under 10 units to over 4000. These are the truck fleets that are the largest segment of trucking today, and that feed, fuel, and provide vital products and services to America's Consumers.

OUR VIEWS IN BRIEF

- NPTC aggressively supports progress in IVHS activities that facilitate commercial vehicle operations. We are strong supporters of IVHS America, and participate fully in ongoing demonstration and developmental projects relating to commercial vehicle operations (CVO).

- The greatest potential for IVHS/CVO is implementation of a Nationwide Commercial Vehicle Network, where trucks can voluntarily travel the nation's highways just as cars do, without stopping at state borders and weigh stations. Vital safety and regulatory checks can be made with technology, automatically, and without delays. Truck Fleets will be able to apply to and supply standard, uniform data to a single state, and their safety, tax and registration information can be placed in a computer record accessible nationwide.

- Current CVO demonstration projects, funded heavily with Federally IVHS grants, must go forward vigorously. The HELP/Crescent project has yielded important information. Advantage I-75 is ready to launch the first-ever multi-state truck preclearance activity, allowing fleets to be weighed in motion, and bypass a series of weigh stations along the I-75 corridor from Florida to Toronto, Canada. The I-80 program is in the concept stage, and will build on earlier experience so that we can begin a true, nationwide link of CVO projects at an early date.

- The most difficult barrier for IVHS/CVO is not technology, but what we call "institutional" barriers—the many states and agencies within states who currently insist on doing things only their way. Already, the ongoing CVO demonstration and research projects are putting chinks in these state walls, and unrelenting Federal

leadership and funding support will be needed to be sure these walls come down sooner than later.

- While we enthusiastically believe in the potential of IVHS/CVO, we must sound caution that the new technology can create difficulties for fleet operators. We want to be sure that CVO is not used as a tool to promote and enforce new truck taxes, and that the rapid development of this technology does not lead to duplication and confusion about the kinds of equipment truck operators will need to purchase and use.

- In addition to CVO activities, truck fleet operators are also interested in other IVHS applications, which can yield many other efficiencies and productivity benefits. These include Automated Traffic Information Systems (ATMS) and collision avoidance systems. Anything that reduces congestion and delay and benefits our operators.

Here are some thoughts on the points raised above:

IVHS America. I want to put in a plug for IVHS America. This unique Federal/public sector/private sector partnership has already yielded many benefits for trucking. Congratulations to the staff of the Federal Highway Administration and the Office of Motor Carriers who have listened well through the CVO Technical Committee of IVHS America, and developed a program responsive to our needs. This responsiveness is a model of federal/private sector cooperation. Thank you, too, Mr. Chairman, for the strong support of your Committee and Congress for IVHS/CVO activities.

National Commercial Vehicle Network. At the April meeting of IVHS America, the CVO Technical Committee met to review and assist an exciting Federal initiative—a National Commercial Vehicle Network. As set out in a concept paper on IVHS developed by the Department of Transportation, the ongoing Crescent/Help, Advantage I-75 and the new I-80 demonstration projects can be linked, and to quote DOT: "By automating these corridors and encouraging expansion of IVHS technologies on other interstates, a fully automated network that will allow trucks to move as freely as cars could become a reality by 1998." This network would be built around several important "service areas" including safety, credential and reporting processes; size and weight screening, hazardous material monitoring and response, fleet management, and cross-border truck transportation.

We urge that your Committee, and other IVHS program authorizing and appropriations committees focus on and adopt this National Commercial Vehicle Network concept. The vision is clear and simple. If we all keep it in mind, the rest of the pieces of the puzzle will quickly fall more neatly into place.

CVO Demonstration Projects. I serve on the Policy Committee of the Advantage I-75 Project. This project is setting a remarkable standard for Federal/State/private sector cooperation. The special leadership of Calvin Grayson, Kentucky Transportation Center, Don Hartman, Project director, and Don Kelly, Kentucky Transportation Cabinet has and is making this project happen. Advantage I-75 is building well on the lessons learned in the Crescent/Help experience and is setting the stage for even more progress in the Interstate 80 corridor. Three years ago the commercial motor fleet community was very skeptical about the prospect of six states and a Canadian Province actually agreeing to recognize another state/provincial clearance and set of credentials. Now it's happening! Not all the bugs have been worked out, and the concept is a long way from meeting its full potential. But it's on the way, and there is no turning back.

These ongoing projects would not have been conceived and grown without Congressional vision and support, Department of Transportation leadership and funding, and the good will on the participants. We urge you to continue financial support and vision for these projects while the National Commercial Vehicle Network is put into place. With concentrated attention and adequate funding, we're going to realize "early winners," and deployment, rather than just "demonstration," will be just around the corner.

Institutional Barriers. There is no question that there are many state to state (and even agency to agency within states) barriers yet to cross. Attachment I, drawn from a recent technical paper commissioned by the Federal Highway Commission, illustrates the complexity of just one of many processes relating to commercial vehicle licensing and registration. Taken as a whole, they seem overwhelming. So strong, unrelenting federal leadership will be needed to develop a simpler national database and communications system to support a nationwide network.

This is more than doable. Think about how bankcards can now be read in automated teller machines (ATMs) not only across town, but across the country and overseas. In the last year I have used mine in Bethesda, Maryland; Alexandria, Virginia; Portland, Oregon; and Paris, France. Is motor vehicle credentialing more complicated? Even the Internal Revenue Service has become more customer friend-

ly, and it is possible to file a tax return electronically. I've attached an early draft of a concept (Attachment 2) that will help you visualize how this might be done. I am certain that the states themselves will save money and become much more efficient when this network is in place. Let's all stick together to make it happen, soon!

Potential Hazards for Commercial Vehicle Operators. Please don't mistake our excitement about IVHS/CVO with blanket endorsement of all proposed uses or approaches to CVO. In many respects, the accelerated funding for IVHS has led to a large number of solutions (Products) without a problem (a real market need). We should carefully focus on the concepts outlined above to skirt the waste and "pork" that could be associated with any large new Federal funding initiative. We should also avoid activities in areas where the competitive business environment has already moved, such as "beet management" technology, including satellite tracking, and mobile communications.

Also, we want to stress that participation in the National Commercial Vehicle network will happen much quicker if it is voluntary, not mandatory. The system itself will yield so many benefits to safe and productive fleets that it will be easily justified and well accepted. It will also allow the Federal Highway Administration and state agencies to focus on those fleet operators who are less safe and less likely to comply with safety, tax and registration requirements. On a cautionary note, though, we don't want to see IVHS/CVO become a tool for unwarranted and accelerated enforcement activities where these are not warranted. NPTC believes this danger can be offset through cooperative efforts with enforcement officials.

Yes, IVHS/CVO will also give many states an excuse to implement and innovate new and onerous "third-tier" taxes (those other than fuel tax and registration systems). We'll have to deal with those on their merits. We oppose such third tier taxes and will work to be sure the efficiencies of uniform, single-state record keeping will improve the overall quality and scope of current, legitimate truck-taxing systems.

And, we are concerned about the "standards and protocols" issue. As an ideal, we want to be sure our members can use one device to serve all IVHS uses, whether these relate to CVO, toll collection or traffic monitoring and control. This requires early and constant attention within IVHS America, and the Society of Automotive Engineers and other standard-setting bodies.

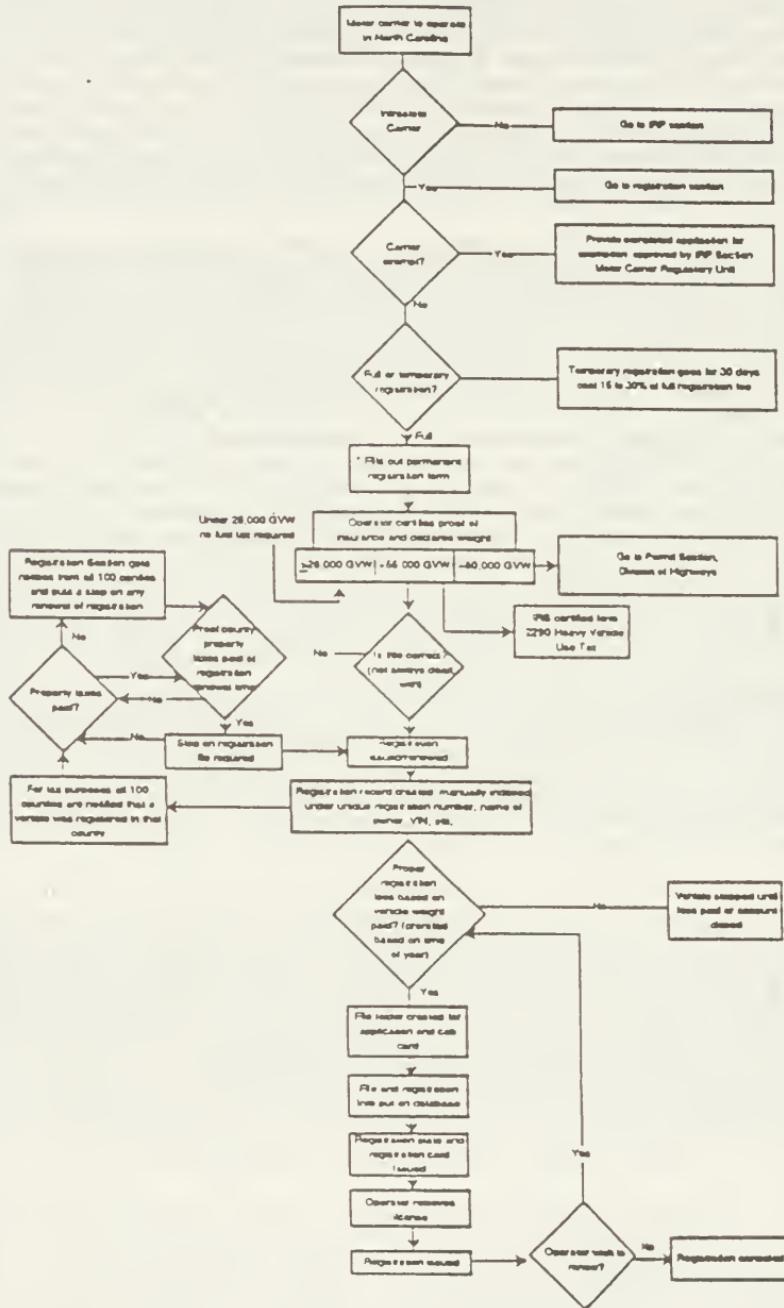
Universal Application. We want to be sure that IVHS/CVO benefits trucking activities, nationwide. Relatively, a small portion of the total truck population will travel significant portions of the nationwide network. Most will work within a 200 mile radius, and not travel the interstates. We see benefits for these operations as well, including the uniform national data base and communications system, traffic congestion information, and toll collection devices. Please keep these fleets in focus as you consider the more dramatic applications for longer-haul fleets.

CONCLUSION

Mr. Chairman, the National Private Truck Council appreciates your subcommittee's focus on this vital new world for commercial vehicle operations. We urge you support and promote a Nationwide Commercial Vehicle Network, continue vigorous funding of the demonstration projects that will allow the network to reach deployment stage, encourage development of a national database and communications to support the network, and be wary of proposals and programs that will cause us to lose focus on this goal, or which will not solve a real problem.

We appreciate this opportunity to testify, and will be happy to respond to any questions you may have.

ATTACHMENT 1—FIGURE 2.7: EXAMPLE OF THE INTRASTATE MOTOR CARRIER REGISTRATION PROCEDURE, NORTH CAROLINA

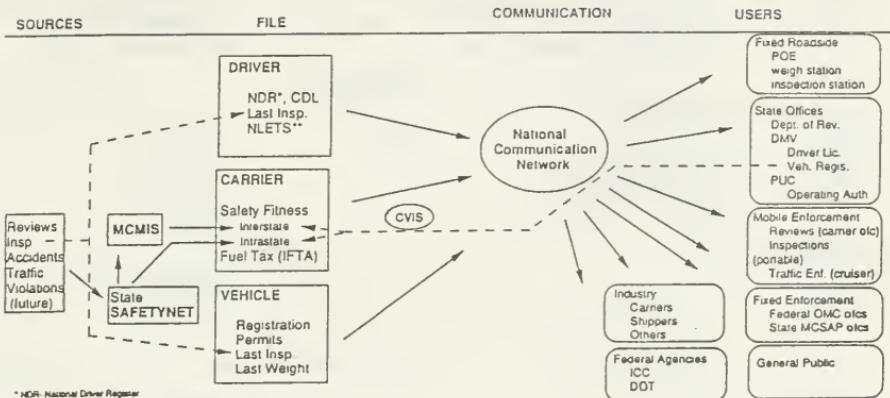


Source: Cambridge Systematics, Inc., from interviews and materials provided by the State of North Carolina, November 1992.

ATTACHMENT 2

Currently _____
Future - - - - - ○

COMMUNICATIONS FLOW of INFORMATION



* NDR - National Driver Register
** NLETS - National Law Enforcement Telecommunications System

QUESTIONS ASKED BY SENATOR EXON AND ANSWERS THERETO BY MR. VOCCOLA

WEIGH-IN-MOTION

Question. What technologies are available today to implement the "weigh-in-motion" concept? How soon do you believe these technologies could be implemented in an integrated "smart" highway system?

Answer. Attached is a listing of companies whose equipment is available today for both slow and high speed weigh-in-motion. Several of these technologies are currently in use on the Heavy Vehicle Electronic License Plate (HELP) System described in my testimony.

WTM MANUFACTURERS

Bridge Weighing Systems, Inc.

Contact: Richard Snyder
University Circle Research Center 1
1100 Cedar
Cleveland, OH 44106
(216) 229-8400

Capital Enterprises and Engineering

Contact: John Irwin
1230-20th Street SE
P.O. Box 12688
Salem, OR 97309

CMI - Dearborn, Inc.

Contact: Joe Madek
28 Lord Road, Suite 267
P.O. Box 389
Marlboro, MA 01752
(508) 481-9066

Data Dynamics

Contact: Brian Taylor
B6-5660 McAdam Road
Mississauga, Ontario
Canada L4Z 1T2
(416) 890-0797

Electronique Controle Mesure

Contact: Claude Maeder
Rue du Bois Chene le Loup
Pole Technologiques de Brobois
54-5000 Vandoeuvre-les-Nancy
France

Siretter - Amer

Contact: Gene Beezley
135 Wicks Street
Grayslake, IL 60030
(312) 223-4801

Toledo Scale

Contact: Bruce Crocco
Systems Division
60 Collegeview Road
Westerville, Ohio 43081

Weighwrite Ltd.

Contact: Len Gorman
49 West Street
Farnham, Surrey
England
011-44 252-711011

EMX Corporation

Contact: George Pagonis
1120 Connecticut Avenue, NW
Washington, DC 20036
(202) 432-8811

GK Instruments, Ltd.

Contact: Geoff Kent
Simpson Road
Fenny Stratford
Milton Keynes, MK1 1LN
England
011-44 908 75742

15212 Race Track Road
Tampa, FL 33626
(813) 855-6556

Golden River Corporation

Contact: Walter O'Connell
7672 Standish Place
Rockville, MD 20855
(301) 340-6800

International Road Dynamics (IRD)

Contact: Art Bergan
International Road Dynamics
702 43rd Street, East
Saskatoon, Saskatchewan
CANADA S7K 3T9
(306) 934-6777

Northwest Signal Supply

Contact: Jon Meusch
17410 SW 63rd Avenue
Lake Oswego, OR 97035

PAT Equipment Corporation

Contact: Jay Lee
P.O. Box 940
20th & 6th Street, Building 8
Waynesboro, PA 17268

Safety Signal Systems

Contact: Rod Norman
7002-220th Street SW
Mountlake Terrace, WA 98043

Sarasota Automation

Contact: Derek O'Garr
1500 N Washington Boulevard
Sarasota, FL 34237
(813) 366-8770

FHWA'S ROLE

Question. During the hearing, the Subcommittee heard a great deal of testimony regarding the need for standards and protocols. What is Lockheed's view of FHWA's appropriate role in this area? What other government agencies and other institutions should be closely involved with respect to standards, and how can Congress encourage this process?

Answer. FHWA involvement in IVHS standards.—The development of suitable standards and protocols will be critically important if the benefits of IVHS are to be realized and maximized. Standards will be required to ensure that the various systems we develop to bring about the myriad of Intelligent Vehicle Highway systems and services are compatible, interoperable, modular and non-interfering. No one will be served by a system which performs a service in one city but, because of design differences, can not be used in another. Similarly, few will be interested in a service which interferes with or precludes the use of another. No one will appreciate the need to throw out last year's in-vehicle navigation or route guidance system because it is incompatible with this year's improved version.

"Standards" mean different things to different people. A manufacturer's idea of an ideal "standard" might be one in which his or her proprietary product is adopted either in a de facto manner by the marketplace or by governmental action. Someone else's "standard" might involve design features so optimistic as to make potential conformance either prohibitively expensive or impossible to achieve. To some, "standard" means the norm; to others, the word "standard" is a synonym for "goal."

In our opinion, a standard should lay out the path to compatibility and interoperability. Any standard we develop should be as open and practical as possible. To the extent possible, it should not require the use of proprietary equipment or intellectual property. If proprietary rights are a factor, sufficient safeguards should be present to ensure that fair and equitable licensing arrangements are available. Rather than specify the details of equipment or a system, a standard should focus on functional, performance and environmental requirements. Standards should describe the inputs and outputs of components or systems and the interfaces between them. Standards should not dictate how such components or systems do their tasks but should rather be concerned with throughput, accuracy, reliability and maintainability requirements. Above all, standards should be flexible, workable and conducive rather than restrictive to competition.

High level staff from the FHWA, FTA and other USDOT agencies are already heavily involved and play leadership roles in activities designed to foster the development of such standards in the IVHS area. For example, FHWA serves as the Secretary of the Standards and Protocols Committee of IVHS America and has been instrumental in coordinating the activities of that group with other IVHS America committees, the FTA and other federal administrations. This coordination is facilitated through communication with other USDOT staff who serve on the Board of Directors the Coordinating Council and each committee and subcommittee of the IVHS America organization. Additionally, these and other FHWA, FTA and DOT staff are actively involved in other IVHS America and DOT activities which are expected to lead to the establishment of an overall system architecture and associated standards.

IVHS America, through its Standards and Protocols Committee, champions and coordinates the standards making efforts of several industry associations and groups that are traditionally involved in such activities. Included in this category are the Institute of Electrical and Electronic Engineers (IEEE), the Society of Automotive Engineers (SAE), the American Society of Testing and Materials (ASTM) and the American National Standards Institute (ANSI). IVHS related standards making efforts are now underway in several of these arenas. The IVHS America Standards and Protocols Committee serves as a clearinghouse for such activities and performs a vital role in minimizing duplicative effort and conflicting results.

IVHS America is also serving as Secretariat for the United States Technical Advisory Group in support of our delegation to the International Standards Organization's (ISO) Technical Committee 204 on Road Transport Informatics (RTI). "Road Transport Informatics" is the term Europeans use to describe what we call IVHS. Our presence at the 150 table is intended to both coordinate our standards making efforts on a global basis and to ensure that the European community does not dictate global standards because of a head start they have in these activities.

Standard making is not easy and requires much time and effort. The best standard is a voluntary decision arrived at by consensus rather than by vote. National IVHS standards are certainly several years away. This is true even with the level of effort now being put to this end. International standards, although being developed in parallel, are even further away.

In terms of other governmental agencies and other institutions in the United States that need to be involved with respect to standards, we suggest that the FCC and NTIA should play a more important role. Many IVHS applications involve the use of dedicated radio communications between vehicles and roadside equipment. Most Electronic Toll and Traffic Monitoring (ETTM) systems will rely on the accuracy and dependability of such communications. Similarly, many driver information, vehicle location, traffic monitoring, route guidance, safety monitoring and auto-

mated highway applications will also depend on this same facility. An elemental aspect of standard making activities in this vehicle to roadside communications area involves the radio frequencies to use. Direct involvement by the FCC and/or NTIA in the standards making process could facilitate the obtaining of frequencies suitable to IVHS needs. Congressional action might be required to allow such involvement.

QUESTIONS ASKED BY SENATOR EXON AND ANSWERS THERETO BY DR. COSTANTINO

Question. Much testimony at the hearing emphasized the need for uniform standards and protocols in IVHS. For the record, please describe IVHS AMERICA's efforts in this area. What specific actions do you believe Congress should take with respect to ensuring uniform standards and protocols?

Answer. IVHS AMERICA plays a leading role in the worldwide standards development process and has been active in IVHS standards from its inception. When IVHS AMERICA was founded, it was our vision not to become a standards developing organization (SDO), even though standards and protocols are extremely important to IVHS AMERICA and to the success of IVHS. Our mission in the standards and protocols area is to derive the requirements for IVHS standards, prioritize them based on need to support deployment, and to communicate these requirements to established standards developing organizations to complete the standardization process. To ensure sufficient focus is given to standards, IVHS AMERICA created in January 1992 the National Center for IVHS Standards. The Center not only provides staff support to the Committee but also monitors and coordinates national and international standards activities, and performs liaison with the federal IVHS system architecture program and standards-setting organizations. IVHS AMERICA has established the Council of IVHS Standards Organizations. Representatives from SAE, IEEE, NEMA, ASCE, EIA, TIA, ASTM and ANSI actively participate on this Council which acts as a forum to disseminate standards information to the SDO's and to also coordinate the activities between the SDO's to ensure the standards are being developed without duplication of effort between any organization. These SDO's have responded to this call to develop IVHS standards and have IVHS standards under development.

Both the U.S. and the international standards efforts are very important to the IVHS program and IVHS AMERICA. U.S. standards will ultimately support U.S. IVHS deployment while international standards will help eliminate any technical barriers that might exist in the global market. It is our goal to try to develop domestic and international standards in parallel utilizing the same resources for both efforts.

There has been progress in the effort to set IVHS standards. IVHS AMERICA's Standards and Protocols Committee has formed a group of key ETTM users (toll agencies) to develop common requirements for AVI and ETTM. Once they reach a consensus, the group will reach out to other toll-responsible authorities, and then to industry suppliers and standards developing organizations, in an effort to arrive at a consensus national standard. Other efforts under the IVHS AMERICA Standards and Protocols Committee include identifying existing standards that might be applicable to IVHS, developing a profile to the Spatial Data Transfer Standard (Federal Information Processing Standard 173) and looking at the interface requirements for traffic management centers.

IVHS AMERICA also plays a leading role in the worldwide standards-making process. Earlier this year, the International Standards Organization formed a Technical Committee (ISO/TC 204) on Transport Information and Control Systems (IVHS) to develop and approve world-wide standards in IVHS. IVHS AMERICA serves as the Technical Advisory Group Administrator for overall U.S. participation in this activity. In addition, IVHS AMERICA technical committees serve as the Working Advisory Groups for several of the ISO/TC 204 Working Groups. Thus, IVHS AMERICA coordinates the participation of more than 200 people in ISO/TC 204 and plays a key role in the ultimate development of IVHS standards.

Congress could aid the national and international standards-making process by continuing to allocate funding to explore new technologies and by urging that standards issues be considered in federally funded operational tests and R&D projects. Additionally, the FCC should be encouraged to listen to the needs of IVHS for available spectrum, especially in light of the 200 MHz of spectrum that will be transitioned from government to non-government use as a result of Title VI of the Omnibus Budget Reconciliation Act of 1993.

Another aid to the development of standards would be following the lead of the European Community by allocating federal funding for the development of consen-

sus standards. The best standards are the ones developed by industry consensus through traditional standards-making organizations. However, these organizations tend to move slowly due to the fact that their work is done by industry volunteers. It would be helpful if the federal government would provide funding to standards-making organizations to pay for full-time staff and consultants who would serve as professionals in the standards development process. This funding could also benefit certain user groups, mainly state and local governments, who traditionally have trouble participating in the standards process. The federal government could also provide financial support for cooperative research programs, such as testing institutes that check products for standards compliance. Ultimately, wide scale deployment and national compatibility will be aided by the Department of Transportation endorsing the IVHS standards developed by consensus based, accredited standards developing organizations.

Question. The Intermodal Surface Transportation Efficiency Act of 1991 calls for an automated highway system test track to be operational by 1997. In the opinion of IVHS AMERICA, is this objective achievable? What obstacles, if any, need to be resolved to reach this goal?

Answer. IVHS AMERICA believes that an Automated Highway System is an integral part of the R&D aspect of the National IVHS Program. FHWA's success in fulfilling the ISTEA mandate for a fully automated test track for AHS depends on two major factors. These are funding levels and the success of the selection of partners for the development consortium.

Congress, while authorizing the AHS Program, did not provide any funds within ISTEA for implementation of the program. Therefore, funding for AHS has come out of FHWA's yearly GOE appropriations. IVHS AMERICA recommends that any future legislation dealing with the AHS include authorization for the necessary funding.

The Federal Highway Administration is currently in the process of selecting a consortium to be DOT's partner in the establishment of the AHS program. Until the selection process is completed, the specific implementation schedule cannot be determined. However, FHWA will be able to perform demonstrations on existing test tracks prior to 1997. The feasibility of a dedicated AHS test track will have to await the outcome of the FHWA consortium selection process. The public/private partnership of IVHS AMERICA expects to play a large part in the AHS Program in its role as a utilized Federal Advisory Committee.

Question. Mr. Kolstad, Vorad Safety Systems, Inc., suggested that the Federal Highway Administration streamline its grant distribution program and provide for more protection of proprietary information. What is IVHS AMERICA's response to Mr. Kolstad's concerns? What other suggestions regarding FHWA's policies in this area do you believe are critical?

Answer. IVHS AMERICA concurs with VORAD that federal and state agencies could streamline their processes for awarding and distributing IVHS grants, contracts, and public/private partnership agreements to private firms. Uncertainties and delays in grantmaking and contracting which for public agencies may only be inconvenient or annoying can be devastating for small entrepreneurial companies. Programs that prepare firms seeking IVHS grants and contracts for requirements they must satisfy and the processes for demonstrating requirement compliance would help avoid surprises and resultant delays.

VORAD's comments concerning DOT's regulations for governing trade secrets and confidential business information are shared by other private sector members of IVHS AMERICA. This issue will be considered at a workshop on IVHS and intellectual property to be held in Washington, D.C. on January 25, 1994 and sponsored jointly by IVHS AMERICA and DOT.

IVHS AMERICA has addressed a number of issues attendant to federal procurement and IVHS in a white paper prepared by its Legal Issues Committee that has been submitted to U.S. DOT as formal program advice from IVHS AMERICA in its role as a utilized Federal Advisory Committee. A copy of that document is attached.

Question. Mr. Kolstad testified that Vorad's collision avoidance system was developed without any money from taxpayer revenue. In this connection, Mr. Kolstad asserted that funding of research projects with long-term paybacks could impair the growth and competitiveness of small, innovative companies. What is your response to Mr. Kolstad's concerns?

Answer. Vorad has done an excellent job of developing a working collision avoidance system. The basic technology their system uses, radar, is an excellent example of the "applications engineering" that will be used to transfer existing technologies from other areas, such as defense. While many such technologies that will be used in IVHS are off-the-shelf, government must find ways to treat both large and small businesses equitably to promote both innovative uses of existing technologies and

research and development of new technologies. Therefore, a mechanism should be put in place that allows small companies with ideas but not capital to approach the government to obtain funding for their work. Similarly, if government sees an R&D need that is not being fulfilled by private sector work, there should be no barrier to government funding work in the area. The government should also break down any remaining barriers to the establishment by the private sector of pre-competitive consortia that pool available resources, and encourage these consortia to focus their work in a single needed direction, to assist in bringing products to market as soon as possible.

Question. In your view, what specific technologies and procedural systems would expedite effective, automated enforcement procedures by the Motor Carrier Safety Assistance Program (MCSAP)? How can these investments help improve commercial vehicle safety in the near term?

Answer. The National Program Plan for IVHS, a joint effort by IVHS AMERICA and the Department of Transportation, provides for the development and deployment of a wide range of IVHS user services. A number of these user services directly address technologies that can support the development of automated enforcement procedures. Specific examples include Automated Roadside Safety Inspections, On Board Safety Monitoring Systems, and Commercial Vehicle Preclearance.

Automated Roadside Safety Inspections provide communication and automation support to roadside safety inspectors, making the safety inspection process more efficient. The service can help identify carriers and drivers who have good safety records (and are less likely to have current safety violations). This allows inspectors to concentrate on drivers, vehicles, or carriers who have a history of violations. The Automated Roadside Safety Inspection service also describes technologies to provide automated inspection capabilities that check the performance and condition vehicle systems including brakes, steering, and suspension systems, without requiring the inspector to manually inspect the vehicle. Systems that measure systems performance rather than relying on manual measurements of individual components (such as push rod travel in brakes) should also improve the effectiveness of inspections.

On-board safety monitoring systems provide a means for sensing the safety status of a vehicle, cargo, and driver at mainline speeds. Driving time and driver alertness are sensed, with warnings provided to the driver (or the vehicle owner or to enforcement or inspection personnel). Vehicle monitoring systems will sense and collect data on the condition of critical vehicle components such as brakes, tires, and lights and determine thresholds for warning and countermeasures. Other sensor systems would sense shifts or other unsafe conditions relating to the cargo.

Commercial Vehicle Preclearance systems provide a means for reporting on board safety monitoring systems results to systems outside of the vehicle. Currently, commercial vehicles must stop at check points where they undergo routine weight, credential, and safety checks. On a cross country trip, vehicles may need to stop and undergo similar checks a number of times. Preclearance allows commercial vehicles to continue past the checkpoints at mainline speeds without stopping. Initially, preclearance systems will probably use historical carrier and vehicle data for safety and credential checks. A similar application of this user service might be a next generation screening process for vehicle inspections. This information could be transmitted to safety inspection stations, allowing inspectors to make more informed decisions regarding the vehicles they choose to inspect.

These systems can improve safety by identifying vehicles, drivers, and carriers more likely to have serious safety related problems. They can also improve the effectiveness of inspection programs by more accurately identify potentially dangerous faults in vehicle systems, and by directing inspectors to potential problem areas.

Question. Mr. Henry, representing the Commercial Vehicle Safety Alliance, emphasized the importance of Federal, State, and private entities working together to design a system that combines information about motor carriers from different databases into only one database. What does IVHS AMERICA see as the best way to develop such a system in light of the different institutional obstacles which may vary from state to state?

Answer. The most difficult barrier for IVHS, and especially CVO, is the many states and agencies who neither coordinate their regulatory information nor share standard regulatory procedures. Interstate cooperation is necessary to make CVO a reality, and operational tests such as HELP/Crescent and Advantage I-75 are already tearing down the institutional walls that keep states from cooperating with each other.

In my testimony, I recommended creating a category of funding within ISTEA that funds CVO deployment; for instance, creating a corridor in the corridors program devoted to the National CVO Network. Once funding becomes available for deployment, institutional issues between states will be easier to overcome. In its rec-

ommendations for FY 1994, the Senate Appropriations Committee stated that "the Committee seeks the widest participation of the States in the program. To expedite progress, FHWA may use an array of administrative mechanisms, including grants to the states, to accomplish the objectives of the CVO component of the National IVHS Program." Such a program would be an excellent starting point for an integrated data system that would serve the varying needs and objectives of the different states that would be involved in the program.

QUESTIONS ASKED BY SENATOR HOLLINGS AND ANSWERS THERETO BY MR. HENRY

Question. FHWA's Role: Role of FHWA with regard to standards and protocols; whether other agencies/institutions should be involved; and what can congress do to encourage the process?

Answer. CVSA views FHWA's role in standards and protocol as one of leadership in the area of operational requirements. The National IVHS Program Plan as it applies to Commercial Vehicle Operations (CVO) calls for multiple uses of electronic devices. The critical requirements fall into two categories: Integration and Compatibility.

Protection should be guaranteed that equipment purchased by states or the industry should meet minimum uniform operational requirements paralleling the intended performance needs outlined in the national plan. These requirements may be met at the time of manufacturing or through an upgrade/retrofit process. FHWA needs to move quickly and decisively toward the establishment of a public domain standard for transponders and interrogator equipment.

With regard to other organizational involvement, the International Standards Organization (ISO) has a significant role. ISO is a worldwide federation of national standards bodies. This organization has many working groups, one of which is addressing IVHS. The FHWA should take an active partnership role with this work group to oversee progress and ensure compatibility/integration relative to North America.

Congress can best help by directing FHWA to actively participate as indicated.

Question. Motor Carrier Databases: What is CVSA's opinion regarding the best way to develop an integrated (CVIS) in light of the institutional obstacles existing between and within states?

Answer. CVSA believes that institutional barriers can be overcome through a justified cost/benefit analysis and the appointment of a Governor's IVHS representative in each state. Accessing truck-related data bases to include the operational safeness of a motor carrier will call for total agreement between agencies and jurisdictions. To achieve this agreement, a state must be able to justify the cost and have a single point of contact who has the authority to resolve internal state conflicts which may exist between governing agencies, while at the same time representing that jurisdiction's best interest in national WHS issues.

Question. Weigh In-Motion: What technologies are available today to implement WIM, and how soon can these devices be implemented in an integrated highway system?

Answer. High speed, or mainline WIM's are in existence today; however, the accuracy is suspect. Testing of mainline WIM is currently underway in a border partnership test between the states of Pennsylvania and Delaware. Mainline weigh equipment from about a dozen manufacturers were examined to reveal if the equipment would perform as indicated by the manufacturer. A final report will be forthcoming.

Question. Mandatory WHS Implementation: Should WHS implementation be mandated and would we favor the replacement of driver log records with electronic record keeping?

Answer. CVSA believes that WHS will be widely adopted on a voluntary basis as long as it is justified on a cost-benefit basis. With regard to electronic log records, the Alliance favors replacement of the manual log record. However, this decision should be made by the motor carrier, not a legislative mandate.

QUESTIONS ASKED BY SENATOR EXON AND ANSWERS THERETO BY MR. KOLSTAD

Question. Protection of Proprietary Information:

Answer. Virtually all of our dealings to date have been directly with the National Highway Traffic Safety Administration (NHTSA), as opposed to FHWA. NHTSA has informed us that essentially all information submitted to them in writing or developed by them is subject to public disclosure. NHTSA has proposed using a government contractor (JPL) to perform tests and evaluations, and then report the final

results to NHTSA. However, NHTSA requires any evaluation to include detailed performance analysis of the system, which would still be included in the report. In addition, even though the evaluation is "voluntary," VORAD has been told it cannot have final decisions on test parameters and conditions, and cannot have final review rights of the report.

Since VORAD cannot specify the testing, there is no assurance that the evaluation will fairly represent the system and its intended functions, nor that the published results will not provide benefit to VORAD's competitors. As there is not currently sufficient research on the causes of accidents to determine with certainty when an individual accident will occur, the results of the proposed hardware evaluations will be very subjective. In addition, as NHTSA does not endorse products and there are no standards for this type of product, the conclusions are very likely to be unsupportive. The end result is that VORAD may have more to lose than to gain by such an evaluation.

The entire subject of the government conducting an after-the-fact evaluation on a product developed by private industry utilizing private funding for commercial applications appears to be unnecessary and excessive intervention by the government. Although the US DOT's stated goals are to encourage and foster the development and deployment of safety technology, these particular types of evaluations in fact discourage such activities. A recent study conducted by the investment banking firm of Alex Brown and Sons indicated that the greatest factor limiting new product development was not technology nor market acceptance, but was political—the uncertainty caused by the government's potential involvement.

When a private company with sufficient foresight and capability is willing to develop a potential lifesaving technology and develops the product for commercial use, the government should not subsequently step in to determine if the product is good enough for the public. The market is far more efficient in determining the cost-benefit tradeoffs than is the government.

We are optimistic and pleased with the interest and energy with which Administrator Slater and his staff are pursuing IVHS activities. We simply are uncomfortable with the current legal protections available to FHWA to prevent public disclosure of proprietary information. We believe these rules need to be updated and strengthened to reflect current technological and competitive environment.

Question. MCSAP:

Answer. The enforcement requirements and procedures of the Office of Motor Carriers must be obtained before recommendations can be made regarding automation.

QUESTION ASKED BY SENATOR PRESSLER AND ANSWER THERETO BY MR. KOLSTAD

Answer. Small Business will definitely be an innovation source for the future. Much technology currently resides in small companies but the big "name" players (Aerospace, Big 3, etc.) have their own agendas and the resources to dominate the process (both program development/direction and funding) with the result that the "smalls" are effectively blocked out. The "bigs" are not beyond taking or capitalizing on the small's technology and the smalls are hard-pressed to stop it.

The playing field must be leveled through the funding process by requiring the IVHS Consortium leadership roles to be more balanced.

QUESTIONS ASKED BY SENATOR PRESSLER AND ANSWERS THERETO BY MR. COSTANTINO

Question. Could you describe your vision of our future transportation system with IVHS and explain to me why it would be worth this investment?

Answer. Over the next twenty years, a national IVHS program could have a greater societal impact than even the interstate highway program. The benefits of IVHS will be widely distributed among society—for rural drivers as well as those in congested metropolitan areas; for older as well as younger drivers; and for the current riders of public transportation systems as well as those who will be attracted to public transportation by the enhancements that IVHS helps make possible. By deploying IVHS throughout our surface transportation system, IVHS will increase safety, reduce congestion and improve mobility, enhance economic productivity, and improve energy efficiency and environmental quality.

SAFETY

IVHS brings information and control to the operation of motor vehicles and therefore offers the potential for substantial improvements in traffic safety. The advent of IVHS technologies offers unprecedented opportunities for achieving breakthroughs in crash avoidance features. Experts have estimated that IVHS can reduce traffic fatalities by eight percent by 2011. Primary safety systems will warn drivers that they are too close to a car in an adjoining lane or that they are in danger of running off the edge of the road. This may prove of greatest benefit to rural travelers. More than half the fatal accidents in the U.S. occur on rural roads due to poor conditions or high speeds.

Important infrastructure improvements will also increase safety. For example, new traffic control systems will reduce the number of vehicle stops, minimize variations in vehicle speeds, and enhance traffic flow. All of these, in turn, reduce the number of accidents.

REDUCED CONGESTION, IMPROVED MOBILITY

IVHS AMERICA estimates that traffic congestion can be reduced by up to twenty percent by the year 2011 with the adoption of IVHS technologies. Information provided to travelers will permit many to avoid congestion, choose alternative modes of transit, or delay their trips.

Rapid detection and clearing of accidents will reduce congestion and the secondary collisions that frequently follow and cause additional delays. Enhanced public transportation systems can divert highway traffic. Real-time, dynamic traffic control systems will adapt to traffic conditions automatically.

Electronic Tolls reduce congestion around toll plazas by collecting tolls automatically and can provide the basis for congestion pricing, a demand management tool for which ISTEA has authorized an R&D program.

ENHANCED ECONOMIC PRODUCTIVITY

The importance of efficient transportation to the nation's economic health cannot be overstated. Yet traffic congestion and accidents cause an estimated \$170 billion a year in lost productivity. Widescale deployment of IVHS will help improve the efficiency of the surface transportation system through safety improvements, minimizing traffic delays, and efficiently routing vehicles. CVO applications of IVHS will specifically aid the efficiency of the motor carrier industry through such innovations as weigh-in-motion and electronic credentialing.

Perhaps the best way to quantify these predicted benefits is to give you examples of what early deployment and operational testing of IVHS systems have already accomplished.

The FAST-TRAC project in Oakland County, Michigan has reduced rear-end collisions in its area by 30 percent and has reduced travel time in its equipped corridors by up to 11 percent. In Los Angeles, an Advanced Traffic Management System called Automated Traffic Surveillance and Control has, since its 1984 installation, cut daily commuter time by 50,000 hours, reduced vehicle traffic light stops by 8 million, lowered fuel consumption by 13 percent, and lowered exhaust emissions by 26 percent. An economic analysis of the benefits of this system concluded that they exceeded costs by a ratio of 38:1. The system is currently being expanded to include over 3800 more intersections in the Los Angeles area, which will result in an annual savings of \$60 million and 10 million hours of travel time and delay. The current expansion is expected to cost \$256 million.

Question. Could you describe any IVHS advancements that originated with defense-related research? Do any of these have both defense and civilian applications?

Answer. The transition of defense-related technology to the commercial marketplace is an area of tremendous interest to all high-tech industries, and IVHS is no exception. Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), and Advanced Vehicle Control Systems (AVCS) all make use of technologies originally created for the defense industry. Many firms traditionally involved in the defense and aerospace industry have recognized this and are now active not only in IVHS AMERICA, but also in soliciting business in the IVHS industry. Such firms include, but are not limited to, Lockheed, Hughes, Westinghouse, TRW, Rockwell, and Raytheon. For example, Allied Signal is the lead contractor on a \$34 million ATMS system in San Antonio.

A major reason for the involvement of defense firms in ATMS is their proven ability at performing systems integration. Many state and local government organizations recognize they do not have these skills "in house" and are contracting for these skills to insure successful system acquisition, maintenance, and operation. Defense

systems also rely heavily on software to collect and fuse data. These same functions are vital to the successful performance of advanced traffic management systems. Future ATMS systems will make use of defense-oriented technologies such as image processing (airborne and satellite reconnaissance). Traffic management systems currently depend on closed circuit TV systems to monitor traffic conditions. Using image processing technologies could eliminate the human monitoring of multiple video displays—automating such functions as incident detection and vehicle counting, speed, and classification.

Defense-oriented technologies can also be used in automobile-based IVHS systems as well as infrastructure-based systems. For example, radar technology, including high reliability, miniaturized package systems, are currently being tested by automobile manufacturers for collision avoidance and other vehicle control systems. In-vehicle route guidance and navigation systems depend on the military Global Positioning Satellite (GPS) system. Future mayday systems may also rely on GPS. Fleet management—both public transit and commercial operations—systems also depend heavily on GPS for vehicle location information. This DOD system will be a vital part of many IVHS systems.

I have enclosed a paper that describes some specific military technologies being used or considered for use in IVHS. As traditional defense firms continue to look to other markets for their products and expertise, WHS AMERICA anticipates that even more dual-use technologies will be applied to IVHS.

[“Military Technologies Used in IVHS,” may be found in the committee’s files.]

QUESTIONS ASKED BY SENATOR EXON AND ANSWERS THERETO BY MR. COLLINS

SAFETY CONCERN

Question. In your written testimony on behalf of the ATA, you emphasized that IVHS programs and technologies should be voluntary, cost-effective, and compatible. You did not mention enhancing safety as a specific separate goal. What is ATA's view on the potential safety benefits of IVHS technologies, and whether such technologies potentially should be made mandatory under any circumstances? Do you believe, for example, that electronic technologies could or should replace driver logbooks in the future?

Answer. ATA is interested in furthering research which may lead to increased safety utilizing IVHS technology. However, as stated in my comments, we believe this technology should be cost-effective, voluntary, and compatible. If new technology could be shown to improve an existing regulatory system, ATA could support such changes as long as the above conditions were met.

However, ATA is concerned that a technological advancement which might be beneficial to some, might be mandated for the entire motor carrier industry. Your example of the electronic technology for driver logbooks is a case in point. Clearly, the technology for electronic monitoring of driver hours of service compliance is not new. Motor carriers have been allowed to utilize this technology to comply with hours of service regulation for several years. In those cases where it makes sense to use the technology, motor carriers are taking advantage of the opportunity. In other cases, such as carriers whose trips are repetitive and well within the allowable hours, a mandated electronic record keeping requirement would be an expensive requirement that would not enhance safety.

We are also concerned that mandating a particular electronic technology for safety purposes could stifle innovation. IVHS technologies are rapidly evolving. We do not want a technology mandated that will require electronics that are quickly outdated.

Finally, a typical long-distance truck earns a profit of only \$2,000 per year. This is based on a per truck revenue of \$88,000 and an average operating ratio of 2 percent. It makes more sense to use limited resources to invest in maintaining and improving the safety features of the truck itself rather than creating an expensive monitoring system that may itself prove difficult to maintain. Saying this in common-sense terms, if you are worried about a leaking roof, fix the roof. Do not install electronic rain monitors around the house to tell you that water is hitting the floor.

We believe that any technology must meet a verifiable safety need and be carefully studied with input from the industry being regulated before it is implemented. We look forward to working with the committee and the DOT in exploring the use of new and existing technology to improve motor carrier safety in the future.

FHWA'S ROLE

Question. During the hearing, the Subcommittee heard a great deal of testimony regarding the need for standards and protocols. What is ATA's view of FHWA's ap-

propriate role in this area? What other Government agencies and other institutions should be closely involved with respect to standards, working with other federal government agencies, and how can Congress encourage this process?

Answer. The FHWA's role is "the banker", directly or indirectly, for many IVHS projects. Because there is so much money headed into IVHS projects, FHWA is and should play an active role in the voluntary standards process. FHWA should continue to be a key player on IVHS activities currently underway in organizations such as the American National Standards Institute (ANSI), the Society of Automotive Engineers (SAE), American Society for Testing and Materials (ASTM), and the International Standards Organization (ISO).

In addition, throughout the standards development process, the FHWA should take a proactive approach building national consensus on IVHS standardization issues among state and other federal agencies such as the U.S. Customs, EPA, DOD and other regulatory bodies that will be affected by these technologies.

After the standards are developed, FHWA should work with industry leaders to ensure that these standards are implemented by the various federal, state agencies as well as private toll roads in projects where the cost benefit analysis justifies utilizing these technologies. This could be accomplished by making compatibility a requirement to receive funds.

Congress can encourage this role by providing the funding for FHWA's active participation in the standardization process, funding the necessary cost benefit analysis and by promoting industry participation in the process.

During the standardization process, it may be necessary to test certain technologies. One way to accomplish this would be to get federal funded laboratories such as NIST and Lawrence Livermore to conduct tests in cooperation with the trade associations and other affected parties.

WEIGH-IN MOTION

Question. What technologies are available today to implement the "weigh-in motion" concept? How soon do you believe these technologies could be implemented in an integrated "smart" interstate highway system?

Answer. Many types of weigh-in-motion (WIM) devices are in use and available today. WIM technology is capable of providing data collection for pavement and other management systems.

As IVHS commercial vehicle operations (CVO) demonstration projects get up and running, WIM will be used for pre-clearance and main-line sorting programs. WIM should enhance the process of size and weight enforcement activities by helping enforcement personnel select vehicles for static scale weighing.

No demonstration has been completed to-date which would provide adequate justification for the use of the WIM concept on a "smart" interstate highway system.

WIM is not a device to be used for direct weight enforcement or for weight-distance tax computation. The devices are not accurate to the degree needed for this type of use. The problem that exists with weighing a moving truck is the same problem that exists when you try to weigh yourself by running across a bathroom scale. At a given point during the movement, the displayed weight may be higher or lower than the true weight. We need to study this problem in the real world before we can predict when WIM is ready for routine deployment.

QUESTIONS ASKED BY SENATOR PRESSLER AND ANSWERS THERETO BY MR. COLLINS

Question. Your statement mentions that there are approximately 245,000 motor carrier companies in this country and the vast majority—88 percent—qualify as small businesses. I understand that one of the goals of IVHS is to reduce motor carrier paperwork burdens. As Ranking Republican on the Small Business Committee, I have been fighting to reduce the paperwork burdens on small businesses. In your view, would current IVHS proposals increase or decrease burdens on small business?

Answer. We applaud your activities to reduce paperwork burdens on small businesses. Many of the paperwork burdens that small carriers face is caused by institutional barriers between and among various federal and state agencies. One obvious current paperwork problem is that these various jurisdictions require carriers to file duplicate information or file it repetitively. IVHS technologies themselves will not solve this; we need to get the jurisdictions involved to coordinate and streamline their paperwork requirements.

Applied in a poorly coordinated or heavy-handed fashion, IVHS technologies could well result in extreme burdens for smaller interstate motor carriers. ATA's three stated goals for IVHS projects—that they be voluntary on the part of motor carriers,

that they be cost-effective, and that they employ compatible technologies—provide a framework to understand how this could come about.

First, if the implementation of IVHS technologies is mandated by any level of government, motor carriers, especially smaller, less well capitalized motor carriers, will face what could often be extremely expensive increases in the cost of their equipment. Many motor carriers will voluntarily choose to employ many aspects of IVHS technologies in their operations. They will have made the decision, for their particular form of trucking, that a new technology will be worth the cost.

Trucking is extremely diverse, however, and what is of use to an interstate for-hire carrier may not be useful for a fleet of dump trucks or for a farm truck. Moreover, IVHS technologies are apt to be costly, and many carriers, especially smaller ones, will have to forgo what, to them, is not cost-effective. Clearly, a mandate to apply a specific technology industry-wide will create a hardship for many.

Second, if IVHS technologies are not cost-effective, their implementation and use will be burdensome for carriers large and small. Assurance that participation in IVHS projects will remain voluntary for carriers will go far toward resolving this problem. However, government subsidization of IVHS technologies which are not cost-effective is itself an economic burden on the highway use taxpayer, large or small.

Third, the employment by IVHS technologies of standards, equipment, and systems which are compatible is of the greatest importance to ensuring that IVHS does not become a burden to the industry. IVHS technologies do offer many benefits to many types of motor carrier operations, large and small. But, if each technology, however beneficial, comes with its own set of equipment and standards, and especially if these vary by region or locality, the benefits for an interstate carrier will quickly vanish. Standards and equipment need not be uniform, but they must be compatible so as to be largely transparent to the motor carrier user.

QUESTION ASKED BY SENATOR EXON AND ANSWER THERETO BY MR. LISTER

Question. What are GPS disadvantages?

Answer. While UPS coverage has improved dramatically over the last few years, the problems posed to UPS in urban areas still include: signal reflection, limited coverage and relatively poor satellite geometries when getting fixes.

Even in areas which wouldn't be characterized as "urban canyons", UPS coverage may be affected.

Downtown sections of cities pose problems for UPS, not only because of tall buildings, but also for the following observations: narrow streets with long blocks, underground streets, elevated trains, tunnels and bridges.

[*"GPS/Dead Reckoning for Vehicle Tracking in the 'Urban Canyon' Environment,"* by Charles Vlcek, Patricia McLain, and Michael Murphy, Trimble Navigation, Ltd., may be found in the committee's files.]

QUESTIONS ASKED BY SENATOR EXON AND ANSWERS THERETO BY MR. MOERSCH

FEDERAL HIGHWAY ADMINISTRATION ROLE

Question. Mr. Kolstad, Vorad Safety Systems, Inc., suggested that the Federal Highway Administration (FHWA) streamline its grant distribution program and provide for more protection of proprietary information. What is your response to Mr. Kolstad's concerns? What suggestions, if any, do you have for revising FHWA's policies in this area?

Answer. MFS Network Technologies concurs with Mr. Vorad that certain changes to the FHWA's grant distribution program would expedite the completion of research and development and highway improvement projects. Expedited release of grant funds is critical to the large number of small, entrepreneurial companies across the United States that are involved in the development of hardware and software for the transportation industry. MFS Network Technologies believes that FHWA should take affirmative steps to make the availability of these grant funds known to small businesses. MFS Network Technologies proposes the following steps to ensure that grant funds reach all eligible applicants in a timely fashion:

- Simplify the application process.
- Reduce the lag time between approval and grant disbursements.
- Re-orient these programs to accelerate commercial rather than "development" phase pilot implementations.
- Earmark specific percentages of total available funds for small, mid-size and large development companies.

- Provide notice of the available FHWA grants to all, including small companies. A proactive targeted mailing list could be obtained and/or developed from industry associations.

Moreover, MFS Network Technologies believe that the grant program should promote new technology, development, and encourage the reuse and/or redevelopment of defense technologies for these commercial applications. This is not, in MFS Network Technologies' view, simply a matter of "defense conversion", since conversion at any price would be tantamount to giving a federal subsidy to an otherwise uncompetitive and value-insensitive group of vendors.

MFS Network Technologies also concurs with Mr. Kolstad's view that there should be more protection for proprietary information submitted to the FHWA. Without the assurance the proprietary information will not be disclosed, details of a technology, which often represent many hundreds of thousands of dollars in development costs and millions of dollars in the marketplace, will not be provided to the FHWA. MFS Network Technologies strongly believes the FHWA must have access to this proprietary information in order to make informed decisions about IVHS technology and technical standards. MFS Network Technologies would be pleased to work with the Subcommittee and/or FHWA to develop procedures to assure confidential treatment of proprietary information.

MOTOR CARRIER SAFETY ASSISTANCE PROGRAM

Question. What technologies and procedural systems would expedite effective, automated enforcement procedures by the Motor Carrier Safety Assistance Program (MCSAP)? How can these investments help improve commercial vehicle safety in the near term?

Answer. Various state agencies and motor carrier operators have formed Commercial Vehicle Safety Alliances (CVSA) in an effort to support of the Motor Carrier Safety Assistance Program. The basic thrust of these alliances is to develop and implement plans and procedures to minimize commercial vehicle accidents and to assure public safety. For example, CVSA are developing and implementing programs related to vehicle safety inspections, driver certification and safe operator driving times, size and weight enforcement, and hazardous materials transportation. I believe the following technologies and procedural systems would expedite effective, automated enforcement procedures by the MCSAP:

Standardization of Plans, Procedures, Fines, etc.

MFS Network Technologies proposes that each state establish a standardized database accessible by a agencies and motor carriers participating in CVSA. Furthermore, by interconnecting (and/or mandating access to) these state databases into a nationwide network, CVO information would be available to the various state agencies and motor carrier operators.

Vehicle Safety

MFS Network Technologies believes that a safety inspection program that includes inspections, corrections (as necessary), and verification of vehicle safety status on the highway should be implemented. The safety inspection facilities should be equipped with a computerized system that would allow access to the nationwide CVSA database, described above. The database would be updated with the information relevant to the inspection\correction\ verification of vehicles. In the future, this information could be stored on an in-vehicle AVI transponder and as the vehicle transits each state. The inspection status of the vehicle could be automatically transmitted to state inspection authorities. Those vehicles not in compliance with CVO safety requirements could be routed to inspection areas.

In addition, information concerning the licenses, training and other information about each driver could be entered into the CVSA database. As each driver starts a CVO trip, specific information concerning the driver would be entered into the vehicle AVI transponder. This information could then be automatically read and checked against the centralized database. The in-vehicle device could also be used to enforce driving time regulations. For example, the driver could enter the time associated with his/her driving activities into the AVI transponder, and as the vehicle transits each state, the time associated with the drivers activities could be read.

Size / Weight Enforcement

Existing and developing technologies such as weigh-in-motion and automatic vehicle classification can also be used to automatically "enforce" size and weight restrictions on commercial vehicles. Using these technologies, a three-dimensional profile of a vehicle, while traveling on a highway, can be made to determine the vehicle's size (length, width, and height), weight per axle and total weight, all within a rea-

sonable degree of accuracy. As described in my testimony, weight data would be entered into the CVSA database and could be checked at each state's port of entry and, if the vehicle maintains a constant weight (within allowable limits), the vehicle would be able to proceed without stopping. A vehicle which is out of size or weight limits would be directed to pull over for physical inspection. Weigh-in-motion technology is available today. Integrated advanced automatic vehicle classification technologies that are required to enforce both size and weight restrictions will be available within six to eight months. The investment required to develop advanced automatic vehicle classification technologies ranges from four to five hundred thousand dollars.

Hazardous Materials Transport

The monitoring of the transportation of hazardous materials could work in the following manner: at the time the CVQ vehicle is loaded with hazardous materials, the operator, using a remote CVSA terminal, inputs information concerning the hazardous materials being carried, the transit schedule and route, permits, licenses etc.; each state would then issue the appropriate authorization for the transport of hazardous materials within its state; these state authorizations would then be written onto the in-vehicle AVI transponder; and as the vehicle enters each state, this comprehensive information concerning the hazardous materials driver, vehicle, etc., would be transmitted using the AVI transponder. The cognizant state and local agencies could then be alerted about the vehicle and the specific hazardous material that has entered their state and/or jurisdiction.

QUESTIONS ASKED BY SENATOR EXON AND ANSWERS THERETO BY DR. ROTHBERG

HAZMAT ENFORCEMENT

Question. In its report entitled, Hazardous Materials Shipment Information for Emergency Response, the National Academy of Sciences noted that because enforcement is not an emergency responder's primary concern at an incident, observed hazardous materials transportation (hazmat) violations often go unreported. How do these unreported hazmat violations affect the integrity of the hazmat enforcement structure? Has the U.S. Department of Transportation (DOT) implemented programs to improve communications between emergency responders and the hazmat enforcement community? What else could DOT do to close the communications gap between emergency responders and hazmat enforcement officers?

Answer. Emergency responders arriving at the scene of a hazmat incident sometimes come across violations of DOT's hazardous materials (hazmat) transportation safety regulations. For example, an emergency responder may discover that a driver does not have required shipping papers to accompany a placarded load, shipping papers are improperly completed, placards on the sides of vehicles are incorrect or missing, or labels and markings on packages and cylinders do not meet DOT specifications.

The National Academy of Sciences (NAS) in its report, Hazardous Materials Shipment Information for Emergency Response, noted that hazmat safety violations observed by emergency responders at an incident often go unreported because enforcement of the hazmat transportation safety regulations is not the primary concern of these personnel.¹ As discussed below, hazardous materials transportation safety would be promoted if the communications gap between the emergency response community and the enforcement community were narrowed.

If the emergency response community took greater advantage of the willingness and expertise of the enforcement officials to investigate allegations of noncompliance with the safety regulations, hazardous materials transportation safety would be promoted. This conclusion is based on the following considerations:

1. Emergency responders can play a major role in spotting examples of noncompliance and preserving this evidence for follow up by enforcement officers. When the emergency response community identifies possible noncompliance with the safety regulations and brings this information to the attention of the enforcement community, Federal and State enforcement officials can better focus their limited staff resources on hazardous materials carriers and shippers that may need additional monitoring.

¹ Such violations as incomplete or incorrect information can impede the ability of emergency responders to conduct their public safety responsibilities and to protect themselves from hazardous situations. For example, considerable time may be wasted at a response scene because the materials involved are not easily identified due to the lack of placards or shipping papers.

2. To promote voluntary compliance with the safety regulations, it is important that all serious violations discovered by Federal and State personnel are dealt with on a timely and effective basis. Vigorous enforcement activities send the message that noncompliance will not be tolerated. Likewise, noncompliance that remains unaddressed only encourages further noncompliance.

Thus, it is important that alleged violations of the safety regulations are reported and that enforcement officers thoroughly investigate these leads. By ignoring observed violations of the safety regulations, the effectiveness of the hazmat safety enforcement structure is somewhat undermined.

Currently, DOT is providing some limited training and outreach projects to the emergency response community regarding the importance of hazardous materials transportation enforcement. For example, the Research and Special Programs Administration (RSPA) has issued a training film intended to encourage responders to preserve evidence of possible violations of hazmat regulations at an incident.

However, there is much more that senior DOT managers could do to improve communications with State and local government police and firefighters. For example, DOT, working with the Commercial Vehicle Safety Alliance, the Cooperative Hazardous Materials Enforcement Development Program, the National Association of Governors' Highway Safety Representatives, and various police and fire associations could implement a planned strategy that would ensure that alleged violations of the Hazardous Materials Transportation Regulations (HMTR) noted by emergency responders, are promptly investigated by appropriate Federal or State enforcement officers. This strategy would need to include information about the requirements of the hazardous materials communication regulations (which include markings, labels, placards, and shipping papers) and improved communications with the enforcement community. Specifically, the Office of Motor Carriers in the Federal Highway Administration (FHWA) and the Office of Safety in the Federal Railroad Administration (FRA) could foster improved communications with the emergency response community to solicit information on alleged violations of the HMTR. These Agencies could establish a more formalized system to improve communications with the emergency response community. Perhaps the 800 number of the National Response Center (or some other mechanism) could be used by emergency responders to report alleged violations of the HMTR. Telephonic reports could then be investigated by appropriate enforcement personnel.

Statutory language does not appear to be necessary to improve communications between the enforcement community and the emergency response community. In response to the NAS report, DOT agencies may seek to improve their communications with and training of the emergency response community. This process might be facilitated, however, by report language addressing the concerns expressed in the NAS report and encouraging further DOT outreach efforts. It would, however, be a major undertaking to contact the thousands, perhaps hundreds of thousands, of emergency response units in the United States.

SAFETY ISSUES

Question. Dr. Rothberg, you have testified previously before the Committee on the issue of truck safety. Based upon your research in this area, what other measures which might improve truck safety generally, and thus hazmat safety, would you propose for the Committee's consideration?

Answer. There are numerous options that the Committee might consider to improve large truck safety. These options include:

- A. ban the use of radar detectors in commercial motor vehicles;
- B. require the installation of antilock brakes on all new commercial motor vehicles or require a performance standard that results in an equivalent level of safety;
- C. require supporting documentation to be retained by motor carriers for at least six months so that safety inspectors could audit more closely the accuracy of log books, thus improving enforcement of hours of service regulations; and
- D. provide additional information to motor carriers about the past employment record of driver applicants.

The following discussion focuses on options C and D, because both of these topics have not been widely discussed in the congressional literature. Options A and B are not considered because they have been discussed in detail elsewhere. The option of letting FHWA gradually improve its truck safety regulations without any new congressional directives for several years is discussed at the conclusion of this analysis.

Option C. Strengthening the Enforcement of Hours of Duty Status (Service) Regulations

The literature contains numerous studies that show that driver fatigue is an important cause or contributing factor to accidents involving large trucks. One of the

major means of seeking to reduce the fatigue of the commercial driver is the hours of duty status (service) regulations which limit the amount of time that a driver can legally operate a commercial motor vehicle. Vigorous enforcement of hours of service rules would promote increased compliance with these critical safety regulations. As explained below, the current Federal regulatory system could be revised to facilitate more effective enforcement of hours of service regulations.

Section 395.8 (Paragraph K) of Title 49 of the Code of Federal Regulations requires records of duty status (driver logs) to be retained at the principal place of business of a motor carrier for at least six months. Although this regulation requires supporting documents to be retained along with driver logs, the term "supporting documents" is not defined in the regulatory code. The regulations do not detail which supporting documents must be retained, nor do the regulations detail the information that must be specified on a supporting document. For example, the regulations do not require the name of a driver to be on a specific supporting document. Thus, under FHWA's regulations, a motor carrier who wants to evade possible enforcement actions for violations of the regulations pertaining to hours of service rules might claim compliance with the current FHWA requirement of retaining "supporting documents" by handing a Federal (or State) safety inspector a batch of documents that do not specify the exact trips, drivers, or power unit number of the vehicles involved. This strategy, which has been used by a variety of motor carriers, creates a maze of obfuscation and complicates the enforcement of hours of service regulations.² For those who support strong enforcement efforts, this situation is far from ideal. This is especially true when it is recognized that some motor carriers will falsify records of duty status to conceal hours of service violations. This can be accomplished in numerous ways. For example, some motor carriers may deny the existence of supporting documents requested by inspectors. Some motor carriers may remove all means of tying a particular supporting document to a record of duty status. Similarly, some employers remove a driver's name or vehicle number from various receipts or shipping papers.

To deal with this situation, the Committee might consider a provision which would make it easier for Federal or State motor carrier safety inspectors to document falsification of log books. Such a provision would require the Secretary of Transportation to amend section 395.8(k) of the Federal Motor Carrier Safety Regulations to require supporting documents to: (1) be retained for a minimum of six months from the date of receipt, and (2) include information identifying driver and vehicle with each supporting document. Supporting documents might include but are not limited to: trip reports, pay slips, bills of lading or shipping papers and receipts for fuels, lodging and various tolls. A supporting document would be defined as: any document or record that is generated in the normal course of business that could be used by a safety inspector to verify the accuracy of a log book entry.

The major problem with this provision is that it would impose additional paperwork burdens and associated costs on industry. Many of these documents are retained for other business purposes.

Option D. Ensuring Adequate Information about Driver Candidates

Section 391.23(2) of Title 49 of the Code of Federal Regulations requires motor carriers (employers) to make an "investigation of the driver's employment record during the preceding 3 years." The nature of this required investigation is rather vague. The regulation does not require the motor carrier hiring a driver to seek specific information on the crash record or accident involvement of the prospective employee, past results of drug and alcohol tests, or other safety-related information. From a safety perspective, the other shortcoming of the current regulation is that it does not require the former motor carrier to respond to the inquiry made by the new motor carrier.

Thus, the value of this regulation for promoting safety and, more specifically, its usefulness to a motor carrier hiring a driver is frequently of little or no value. This is especially true when the previous motor carrier refuses to supply any relevant information to the hiring motor carrier. An example of how the Section 391.23 regulation when combined with other regulations could lead to safety problems is presented below.

Under the current Federal regulatory scheme specified in the Section 391.23, drug testing, and driver qualification requirements, a truck driver that was recently fired from one company for testing positive for drugs as evidenced by a random drug test can gain employment with another truck company almost immediately. The fired driver, who was thought by the hiring (new) motor carrier to be otherwise qualified to operate a truck, could be hired after testing negative for drugs on the pre-employ-

² Based on numerous discussions with various DOT enforcement officers, 1993.

ment drug test.³ The newly hired driver may continue to have a serious drug problem, but this would not necessarily come to the attention of the hiring motor carrier. The former motor carrier (employee) may decide not to supply any relevant information on this issue.

FHWA or the Congress might consider either eliminating the Section 391.23 regulation or changing it in a manner that would make it useful to the hiring motor carrier, but not unduly burdensome on the former motor carrier.

To reduce the possibility that a motor carrier unknowingly hires drivers who pose a major risk to the public and a financial risk to their company, the Secretary of Transportation could be required to amend section 391.23(2)(c) of the Federal Motor Carrier Safety regulations to specify the scope and nature of the information that must be sought by the new motor carrier regarding a commercial driver applicant. Such information could include records of crashes/accidents involving a driver, the results of past drug and alcohol tests and other safety-related information that the Secretary judges to be appropriate for the new motor carrier. The Secretary could require the former motor carrier (employer) of a driver applicant to supply such information within a thirty day period after the original inquiry by the new motor carrier. As a condition for employment in the motor carrier industry, the driver would likely have to be required to give the former motor carrier permission to release sensitive information, e.g., relevant drug testing information, to the new motor carrier. The Secretary could also allow the driver to review and comment on any records or information provided to the new motor carrier.

There are several difficulties that would need to be worked out through the rule-making process to initiate the option outlined above. For example,

1. Many former employers are concerned about being sued for supplying information about former employees.

2. If a driver has been totally rehabilitated from a drug problem, should past drug testing results be conveyed to a new employee? How would rehabilitation be determined?

3. Adequate safeguards to protect the privacy of the information would need to be built into the regulation. For example, sensitive information might need to be transferred only from the safety director or medical review officer of one company to the safety director or medical review officer of another company, with appropriate penalties for the unauthorized release of information.

4. The protection provided under the Americans With Disabilities Act would need to be considered, especially as they apply to a person who has been rehabilitated from a drug problem.

The challenges of writing a workable regulation would be considerable, but the Federal Railroad Administration has dealt with similar problems. There is always the possibility that FHWA will address these policy issues as it revises its current drug testing regulations or during its comprehensive review of its regulations now underway.

Gradual Change

There is also the argument of letting FHWA gradually revise the Federal truck safety regulations without the imposition of additional congressional requirements for several years. FHWA already faces a large backlog of regulatory actions pertaining to truck safety. Primarily as a result of past congressional actions there are approximately 35 proposed regulations or required studies relevant to motor carrier safety awaiting final completion by the Secretary of Transportation. Rulemakings or reports are due in many critical safety areas, including vehicle length/weight restrictions, violation of out-of-service orders, hazardous materials transportation safety permits, and expanded drug and alcohol testing requirements. In fact, particularly during the last two years, the Secretary has failed to meet many deadlines for final regulatory action pertaining to truck safety initiatives that were set in statute.

Thus, if Congress enacted no additional rulemaking requirements for several years regarding truck safety, the U.S. DOT would still have several years worth of work pending to complete past congressional requirements and other pending regulatory initiatives.

³This test must be ordered by the hiring motor carrier.

QUESTIONS ASKED BY SENATOR EXON AND ANSWERS THERETO BY MR. SLATER

STANDARDS

Question. During the hearing, the Subcommittee heard a great deal regarding the need for uniform standards and protocols. (a) What is the Federal Highway Administration (FHWA) doing in this area, and (b) how is FHWA cooperating with other Government agencies, such as the Federal Communications Commission, and the States? (c) Please describe specific initiatives intended to provide federal leadership with respect to standards.

Answer. (a) At the present time, the FHWA is working with the Standards and Protocol Committee of IVHS AMERICA and the nationally recognized standards-making organizations, such as the Society of Automotive Engineers (SAE), the Institute of Electrical and Electronic Engineers (IEEE), and others. The Intelligent Vehicle Highway Society of America (IVHS AMERICA) has created an IVHS Standards Council comprised of these leading nationally recognized standards-making organizations to identify existing standards which may be applicable to IVHS and to ensure that necessary new IVHS standards are developed by the applicable organization. These organizations are working to define the near-term IVHS standard needs. For the near-term (up to 5-8 years from now), the FHWA has elected to follow its historic practice of using these organizations to identify the areas where IVHS standards are needed and then to develop the standard through the consensus process. Since this process usually takes from two to four years to develop a standard, the FHWA will provide, as necessary, technical and administrative support to shorten the process to one to two years. Overall, this process is working well now.

In the future, in addition to the above effort, the IVHS system architectural design process will provide guidance and define the areas where IVHS standards are needed and determine the most appropriate nationally recognized organization to develop the standard.

(b) The Department is including other Federal departments and agencies in the National IVHS Program. For example, the Department participated in the selection process for the Department of Defense's (DOD) 1993 Technology Reinvestment Project. For the 1994 Technology Reinvestment Project, the Department will be a full partner with the Defense, Energy, and Commerce Departments along with the National Science Foundation and NASA in a search for defense technologies which could benefit the IVHS program. The Department is also working cooperatively with DOD's Tank and Automation Command on their Robotics Convey Project. Additionally, the Department has a Memorandum of Agreement with the Department of Energy, and is working to develop one with the Department of Commerce. Furthermore, a number of the National Laboratories are participating in the National IVHS Program through activities funded by the Department.

The Department has established both formal and informal coordination with the Federal Communications Commission (FCC), including providing comments to the FCC on various proposed spectrum actions which could affect IVHS. The FHWA met with the FCC staff in November 1993 to further discuss the National IVHS Program and the need for frequency both in the short and long term.

(c) FHWA with IVHS AMERICA is working to develop a standard for vehicle to roadside communications (VRC). VRC originally was called automatic vehicle identification (AVI) when the technology capability was simple vehicle identification. The technology now allows two-way communications.

FHWA has under contract Lawrence Livermore National Laboratory (LLNL) and the National Institute of Standards and Technology (NIST) to define the functional and technical requirements for Commercial Vehicle Operation services. IVHS AMERICA is working with toll collecting States and agencies to define the functional and technical requirements for future toll collection applications. These efforts are currently being undertaken separately because the applications are different: toll collection is lane specific, whereas CVO communications are better when applicable over all lanes. However, these two efforts are being closely coordinated by the FHWA so that the resulting standards will be as compatible as possible.

The goal of the FHWA effort underway with LLNL and NIST is to provide direction for a standard on a two-way VRC with the capability to be connected to on-board safety sensors. The LLNL and NIST will list CVO needs of States and motor carriers, survey what VRC is available in the marketplace or on the drawing boards, and make recommendations to the FHWA on how to proceed to develop a single standard unit which will satisfy the needs of all users. It is expected that this effort will be completed in the first quarter of FY 1994. A determination will then be made on how best to implement the recommendations and establish the standard.

Question. From FHWA's perspective, how does the Global Positioning System (GPS) technology relate to IVHS? What initiatives can be made in IVHS to help civilianize GPS so that GPS can pay its own way? What progress has been made on the joint Department of Transportation/Department of Defense working group on GPS policy? Does FHWA have a position as to whether GPS should be under defense or civilian control?

Answer. The Global Positioning System (GPS) is an integral component of IVHS. Analysis is currently underway within the Department to establish commonality of equipment, data, etc., for GPS which will assist not only the IVHS program but the aviation, marine and other land modes of transportation. The DOT is working closely and cooperatively with the Department of Defense (DOD). A report from the joint DOT/DOD Task Force on GPS will be delivered to the respective secretaries by December 1, 1993. The FHWA favors a joint working relationship of GPS by DOD and DOT.

IVHS DEPLOYMENT

Question. Dr. Costantino of IVHS AMERICA testified that funds authorized for IVHS in the Intermodal Surface Transportation Efficiency Act will not lead to an integrated national IVHS highway system; that these funds are more for research and development and not for uniform deployment of IVHS technologies. What is DOT's response to Dr. Costantino's assertions? What can FHWA do to encourage States to deploy available IVHS technologies to promote uniformity and compatibility?

Answer. Much of the limited Federal funding authorized for IVHS in the Intermodal Surface Transportation Efficiency Act is being used in support of research, development, and operational testing of IVHS concepts and technologies. Deployment of these IVHS concepts and technologies will depend on the decisions of public agencies on how to invest other Federal-aid funds, State and local tax dollars, and funds from other sources, and on the purchasing decisions of individual consumers. However, the Department realizes that the success of the IVHS Program depends on the extensive deployment of IVHS services, functions, and technologies into a nationally compatible and integrated system. The Department is pursuing many activities to foster and encourage this deployment. We have developed a Deployment Plan to identify, coordinate, and recommend deployment-related activities within the Department. This plan will be incorporated into the overall National IVHS Program Plan being developed by the Department and IVHS AMERICA. We are using the IVHS Early Deployment Program to provide grants of assistance to selected state and local transportation agencies and Metropolitan Planning Organizations for the development of multi-year IVHS strategic deployment plans in major metropolitan areas and intercity corridors. We have developed a generic planning process to assist local areas in determining their unique needs and assessing the IVHS services and technologies that will best help them. We also have various activities underway to identify and address institutional and legal issues that may hinder deployment of IVHS. Finally, we are fostering a nationally uniform and compatible system by funding the development of a national system architecture for IVHS and participating in the discussion and development of related component standards.

IVHS CORRIDOR PROGRAM

Question. In accordance with the IVHS ACT, the Subcommittee understands that FHWA has designated four sites to develop IVHS corridors: the northeast section of I-95, the midwest area including Chicago, the Houston-Dallas area, and southern California. How will FHWA insure that limited funds will be distributed fairly among these corridors and that technologies deployed in these corridors meet national needs?

Answer. The four areas identified were designated as Priority IVHS Corridors using criteria included in the IVHS ACT (note: the Priority Corridor in Texas is limited to the Houston area, not Houston-Dallas). In fact, these four regions were the only areas which fully meet the criteria in the IVHS Act, primarily based on their severe or extreme nonattainment designation for ozone.

We are working with these four areas to develop Corridor Program Plans which will outline key IVHS-related objectives in the Priority Corridors along with a program of projects which would address these needs. As part of this program within each area, we expect that these Priority Corridor projects will contribute to the national IVHS program, especially through conduct of high-priority operational test projects.

The scope and extent of needs and potential contributions within each Priority Corridor will vary, and we do not have a pre-established distribution formula for the annual authorization of funds. We base annual fund obligation decisions concerning each Priority Corridor on several factors, including the status of the Corridor Program Plan, level of national priorities being addressed by the proposed projects, and degree of budget flexibility provided through the annual appropriations process (which frequently includes earmarks to specific projects, reducing the amount of funds available for the Priority Corridor organizations). We believe these factors, along with the on-going coordination being provided through IVHS AMERICA and DOT representatives in the Corridor organizations, will assure that IVHS initiatives in the Priority Corridors meet national needs.

IVHS GRANTS

Question. Mr. Kolstad of Vorad Safety Systems, Inc., testified that Vorad's collision avoidance system was developed without any public funding. In this connection, Mr. Kolstad asserted that funding of research project with long-term paybacks could impair the growth and competitiveness of small innovative companies. What is FHWA's response to Mr. Kolstad's concerns?

Answer. There are a number of Federal programs that can help small innovative businesses fund research projects. Small businesses are always encouraged to respond to the Department's Operational Test solicitations and R&D Requests for Proposals. We have two programs in R&D that assist small business: the Small Business Innovation Research program and the IVHS-IDEA program.

The Small Business Innovation Research program solicits small businesses, with their valuable resources and creative capabilities, to submit innovative research proposals that address high-priority requirements of the Department. These proposals can address any priority transportation need and are not specific to IVHS. Funding is provided for feasibility studies with the possibility of follow-on funding for research and development efforts.

The IVHS-IDEA program, administered by the Transportation Research Board, seeks proposals from organizations of any size. The purpose of the program is to explore, evaluate, test and develop the application of new concepts, innovative technologies, methods and processes for the highway and intermodal surface transportation system.

SAFETY INITIATIVES

Question. You testified that FHWA is coordinating efforts with the States to develop a uniform informational system for preclearing commercial vehicles. What other specific initiatives are being implemented by FHWA to aid Motor Carrier Assistance Program officers in enforcing safety regulations effectively? Are these initiatives promoting uniformity and interstate compatibility of data systems and other IVHS technologies?

Answer. The FHWA, the National Highway Traffic Safety Administration (NHTSA), and several States are jointly evaluating innovative brake testing technologies which could reduce the time of inspection by as much as two-thirds. Devices under consideration include:

- a mobile inspection trailer (developed for the Government of New South Wales, Australia);
- a portable roller dynamometer (Hicklin Engineering)
- a combination skid testing and weighing device (Hunter Engineering);
- several infra-red devices (developed by several engineering companies and California Polytechnic State University); and
- Batelle will be establishing the standards and protocols for evaluating the brake testing technologies.

The FHWA and States are also evaluating technologies to collect and transmit roadside inspection data more quickly. Technologies being evaluated include:

- hand-held pen-based hardware and software to replace the tedious clip-board method of data collection.
- voice recognition software to transfer voice commands into SAFETYNET compatible data.

The efficient and accurate collection of safety inspection data is a key element of the CVO effort. It will allow remote data entry and access to this safety data at the roadside and electronic verification of a carrier's safety status at highway speeds.

- The FHWA and American Trucking Research Institute of the American Trucking Associations are researching the feasibility of using standardized diagnostic equipment for roadside inspections and maintenance.

• The Sandia National Laboratory is conducting research on: technologies for roadside inspection; monitoring/enforcing out-of-service violations response; and to hazardous materials incidents.

The Senate, in its 1994 DOT Appropriations Report, directed the FHWA to automate roadside safety inspections and develop communication links between at least 100 MCSAP sites with the intent of providing enforcement officials, at the roadside, access to national safety data on commercial vehicles, drivers, and carriers.

The FHWA will continue to work diligently with our State and industry partners to ensure uniformity and compatibility of this safety initiative and those described above.

DATABASE DEVELOPMENT

Question. Mr. Henry, representing the Commercial Vehicle Safety Alliance, emphasized the importance of Federal, state, and private entities working together to design a system that combines information about motor carriers from different databases into only one database. What does FHWA see as the best way to develop such a system in light of the different institutional obstacles which may vary from state to state?

Answer. Partnerships among stakeholders are critical in the development and implementation of information systems that link various safety data sources. The FHWA is currently working with its State and industry partners in determining how to best develop a national information system to meet the multiple needs of the various users and achieve the IVHS/CVO program goals for:

1. a national CVO electronic clearance system for trucks and buses;
2. the automation of roadside safety inspection sites; and
3. the ISTEA-mandated feasibility study of linking motor carrier safety fitness data with registration in the Commercial Vehicle Information System project.

HAZMAT

Question. In your written statement, mention was made of the potential of IVHS to add to highway safety through hazardous materials tracking systems. Please expand on this reference concerning the possible operation and benefits of such systems.

Answer. It has been proposed, for incidents involving trucks carrying hazardous materials, that IVHS/CVO technologies be used to provide immediate, accurate information about the material or combination of materials onboard to emergency responders. As one of the six proposed IVHS/CVO services, this service may have potential benefits to enforcement and emergency response teams in the form of hazardous materials incident notification. Expanded incident data for this service could include time, location, and nature of the incident.

The specific benefits are twofold: 1) more reliable information enhancing response preparation and efficiency; 2) reduction in response time due to automated notification.

QUESTIONS ASKED BY SENATOR PRESSLER AND ANSWERS THERETO BY MR. SLATER

Question. Could you describe your vision of our future transportation system with IVHS and explain to me why it would be worth this investment?

Answer. As discussed in the Department of Transportation's December 1992 IVHS Strategic Plan—Report to Congress, the vision for the future of surface transportation is one of improved use of infrastructure and enhanced user choices through the application of appropriate IVHS technologies and services. Because of dwindling financial and capital resources, public agencies have to take a "systems"—or "intermodal"—approach to addressing surface transportation needs. The IVHS program provides these agencies with tools to address transportation needs in addition to building capacity. The IVHS program also provides a range of technologies and services to augment the safety and convenience of trips for transportation users. IVHS technologies and services include traffic management systems that adjust roadway traffic based on current conditions, public transit enhancements such as realtime displays of service status, systems that electronically weigh and inspect commercial vehicles in motion, and a variety of innovations to supplement the driver's efforts including in-vehicle vision enhancements during times of reduced visibility. The keys to IVHS are broader choices for both transportation providers and users that have the potential to save lives, save time, and save money.

Question. I understand several demonstration projects for IVHS are underway. What, in your view, have been the significant findings to date?

Answer. The FHWA has been involved in conducting Operational Tests of IVHS in one form or another for a number of years. Using advanced technologies for managing transportation facilities certainly predates the establishment of the IVHS program. As the IVHS program has developed, a number of issues or lessons have been realized that should help guide the development of the program and also indicate areas that need further consideration.

For example, we have learned that drivers can be convinced to divert to less congested routes if presented with reliable and credible traffic information. This has been demonstrated on Long Island in the INFORM project where changeable message signs present traffic flow and alternate routing information to motorists. Five to ten percent of mainline traffic can be diverted over several off-ramps. Because of the incident-related messages displayed on the signs, there is an estimated annual delay savings of 300,000 vehicle hours. The ramp metering system implemented with INFORM resulted in a three to eight percent increase in freeway speeds for the morning peak period.

Also, the New York State Department of Transportation has successfully operated the INFORM system through contracts with private firms, thereby demonstrating that with appropriate oversight it is possible for transportation management and control systems to be privately owned. This concept is also being demonstrated in Westchester County in New York, where a traffic information firm is under contract to operate the county's traffic management system.

The Smart Corridor project in the Santa Monica Freeway corridor in Los Angeles has provided a number of technical lessons. Data from both freeway and arterial street control systems were successfully combined to produce useful, integrated information for travelers in the corridor. The Pathfinder project, which operated in the Smart Corridor, demonstrated that real-time, current traffic condition information could successfully be transmitted to vehicles and presented to drivers through in-vehicle devices. These devices were navigation units that showed the vehicle's location on an electronic map along with symbols indicating where there was traffic congestion. Pathfinder also demonstrated that travel information from vehicles, or "probe" information, could be sent from individual cars to a traffic information center. The TravTek project in Orlando, Florida, also demonstrated that probe information could be transmitted from vehicles to a traffic management center. TravTek also demonstrated that routing instructions, in the form of directional arrows and voice messages, can safely be presented to drivers in their vehicles. This conclusion is based upon early results from questionnaires and interviews of participants. These early results have also indicated that the public is very enthusiastic about in-vehicle routing devices. TravTek was the first major exposure of IVHS-type equipment to the general public. Most of the nearly 3,000 participants in TravTek rented their TravTek cars through the American Automobile Association (AAA) and Avis Rent-a-Car. Most found routing information very useful, particularly in unfamiliar locations.

One of the technical issues that TravTek illustrated was the complexity of incorporating different firms' data bases into operating equipment. Specifically, the two digital map data bases that were required in the TravTek cars had to be correlated and coordinated for proper operation. Preliminary results from the evaluation data show that those who had TravTek planned their trips 81 percent faster than those who did not have TravTek. For examples non-TravTek drivers took about 7.25 minutes to plan a twenty minute trip compared to roughly 1.5 minutes for those with TravTek. Moreover, once the trip was planned, those with TravTek reached their destinations 20 percent faster than those who had no TravTek features, taking roughly 22 minutes compared to 27 minutes for those without TravTek.

TRANSCOM (Transportation Operations Coordinating Committee), a consortium of 15 transportation and public safety agencies in the New York, New Jersey, and Connecticut area, has successfully demonstrated the value of cooperative efforts in large metropolitan areas. The initiatives which TRANSCOM has undertaken demonstrates that diverse public agencies can work together to plan and implement a system of traffic management strategies and technologies. Major initiatives to date have included:

- operation of a clearinghouse for information on potential congestion locations such as accidents and construction sites;
- coordinated applications of variable-message signing, advisory radio, and closed-circuit television monitoring of traffic conditions across multiple jurisdictions;
- managing the conduct of an IVHS operational test which will use electronic toll tag readers as a means of gathering traffic flow information; and
- taking the lead in developing overall IVHS implementation strategies in the metropolitan area.

Successes in carrying out each of these efforts shows the value of having a regional entity provide a focus for transportation management initiatives, with an overall goal of operating a regional transportation network in the most efficient, customer-oriented manner.

Other less technical issues have also come to light in the IVHS Operational Tests. TravTek showed that a public-private partnership can be very successful in designing and implementing an advanced technology project in the transportation field. The arrangement whereby funds were not combined or pooled, i.e., separate, coordinated, individually-funded activities, seemed to make implementation of the system somewhat easier. The ADVANCE project in Chicago has demonstrated that it is possible to enter into a partnership agreement that permits a public agency (such as a State DOT) to serve as a funding "conduit" for Federal funds in a pooled funding project. While this combining of funds and subsequent government auditing requirements have presented some problems to private sector partners, the ADVANCE partnership is addressing these issues and exploring measures that will be fair to all parties and also assure that public funds are properly used. Intellectual property rights and liability issues have also presented interesting challenges in formulating partnership agreements. The Fast-Trac project in Oakland County, Michigan, along with TravTek and ADVANCE have provided many opportunities for refining the legal language that must be included in partnership agreements. These projects have also permitted our private sector partners to share their concerns with current government procurement provisions and other regulations that apply to public/private sector ventures. The HELP/Crescent project has successfully demonstrated that several States and the motor carrier industry can work together for the benefit of both groups. Through the Crescent project, these parties are testing technology that can provide cost savings to the industry and increased efficiency to the States.

Question. How will IVHS benefit our nation's more rural areas?

Answer. Rural highways serve as the foundation for linking America's communities and resources to each other. Although 60 percent of total travel is urban, the 40 percent on rural roads is still a major share of the Nation's travel demand. Furthermore, the percentages of fatal accidents are nearly reversed—57 percent occur on rural roads. The entire travel community needs the benefits that IVHS can deliver. The need for advanced solutions to rural and small community transportation problems is considerably broader than only serving the public who live there, it also includes the majority of citizens and millions of foreign visitors who travel through the rural transportation network each year.

The goals of IVHS for rural areas are to:

1. improve the safety of rural transportation systems;
2. provide better information to rural travelers;
3. reduce and mitigate traffic congestion in rural areas; and
4. improve maintenance on rural roads

In the more rural areas, the benefits of IVHS will primarily be improving safety, whether it be crash prevention or detection and response to a crash. IVHS technologies and systems are capable of:

- speed enforcement;
- warning of excessive speeds for conditions, especially trucks on steep grades and curves;
- detection of driver impairment, whether alcohol, drugs, drowsiness, inattention or distraction;
- warning of hazardous situations, such as rock slides, unusual geometrics, railroad crossings;
- warning of "leave-the-road" conditions;
- warning of vehicles or other objects intruding into the vehicle's path; and
- detection of the incident and notification of emergency medical services.

A number of other IVHS applications, including commercial vehicle operations, systems that help rural and small town transit users, and traffic control and management systems will also provide benefits to rural areas.

Question. Given our current fiscal realities, how would you recommend we fund a long-term program such as this?

Answer. Since its inception, the focus of the Federal IVHS program has been on supporting research and development, operational testing, and institutional analysis. Given our current fiscal realities, the Federal government should continue its current focus. In order to leverage funding for the program, the Department of Transportation uses partnerships and cooperative arrangements for most operational testing projects. When feasible, partnership arrangements are also used for research and development. The Department is also "piggy-backing" on other technology and industry initiatives including defense conversion programs and advances in the telecommunications industry. IVHS will be fully deployed only if State and

local governments and the private sector are convinced that implementation and commercial development of the technologies and services are worth the investment.

Question. I am concerned that perhaps the amount of electronic equipment necessary for IVHS would greatly increase vehicle prices. In your judgment, how would IVHS technologies affect the cost of vehicles?

Answer. Some of the IVHS user services will make use of, and in some cases, rely upon, equipment that is installed in vehicles. While there is little doubt that any additional equipment installed in vehicles must be reflected in the vehicle's cost, the incremental increase because of IVHS-related equipment can be relatively small. Many of the IVHS functions and services can use devices and equipment that are installed in vehicles for other purposes. As an example, the "dead-reckoning" positioning system used by the vehicles in the TravTek project in Orlando used wheel sensors that were part of the anti-lock braking system. Also, the in-dashboard screen that was used in TravTek as the driver interface was an available option that was used to control the heating, air conditioning and radio of the car. Similarly, in-vehicle compact disk (CD) players in the future may be able to be used to access CD-ROM that may contain electronic map or other information.

As with all features of vehicles, the market will determine how much in-vehicle IVHS-related equipment will cost. Early results from participants of the TravTek project indicate that as an option on a new vehicle, they would be willing to pay (on average) just under \$1000 for a TravTek-like device. A possible analogy for certain IVHS-related equipment would be the cellular telephone, whereby users are virtually given the equipment and then pay for the services that the equipment provides. With the on-going evolution of micro-computer and communication technology, the incremental costs for providing additional functionality, including IVHS-related functions, in vehicles becomes smaller and smaller.

It must also be pointed out that IVHS is a very broad program. The possible impacts of deploying IVHS technologies and strategies may have on society will benefit many people who will not have to pay directly for equipment or services.

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